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Vol. V. NEW YORK, FEB. 28, 1885. No. 9.

Handsomely bound volumes of THE ELECTRICAL WORLD *for* 1884 *are now ready, and will be sent, charges prepaid, to any address on receipt of* $5.00.

AN underground telegraph bill has been killed in the New Jersey House of Assembly. After all, in spite of the tirades against them of the Rev. Mr. Talmage, there is some sound common sense to be found in the legislators at Trenton.

SOME of the lobbyists in Massachusetts appear to be thirsting for the blood of the American Bell Company, whose wish to increase its capital stock as expressed in the petition to the Legislature is now being vigorously discussed in the State.

FROM all we can learn, the hard-drawn copper wire has stood the severe tests of the winter very satisfactorily, and an extension of its use may be expected. We have obtained, and publish to-day, the instructions issued by the Baltimore & Ohio Company to linemen who handle this wire. The points insisted upon as of importance are those to which attention has already been directed in our columns.

THE Western Union Company, or its Southern representatives, are no respecters of "color." We have already mentioned their intention to dispense with white messengers, and on Feb. 19 the intention was carried into effect at Atlanta, Ga. All the white boys were discharged and a complete force of "coons" was brought in and placed under charge of the young ladies who act as delivery clerks. Suppose the innovation should not stop here, but that colored operators should be tried!

CONGRESS has been invited to join in the fight of the Baltimore & Ohio Company for the same privileges from the railroads as are granted to the Western Union Company. The U. S. Senate has asked the Secretary of the Interior for information with regard to the practice of the railroads that have been subsidized by the country and are said to be discriminating in favor of one telegraph company against all others. Mr. Bates is not to be denied.

OUR attention has been drawn to the fact that in our recent article on electrometers at the Electrical Exhibition, Philadelphia, we gave credit to Messrs. J. W. Queen & Co. for instruments that were exhibited by the Electrical Supply Company of this city, and of which we showed illustrations. We are glad to make a correction of the mistake, in justice to the latter company, who, it will be remembered, had a large and excellent exhibit of imported as well as of domestic testing apparatus.

THE new building society, started by Western Union officials and other employés at 195 Broadway, promises to become a great success. It is local in its operation, but a large number of shares have already been taken up, and work will be begun at once. The president, Mr. James Merribew, is well known as general superintendent of the Western Union Company, and the other gentlemen on the Board of Management are all deserving of the confidence placed in them. Full particulars will be found in *The Operator*.

THE English electric light companies and the Dynamicable Society—composed, not of reckless Fenians, but of the leading electricians of the country—are still striving to obtain more favorable terms from Mr. Chamberlain and Parliament. It is to be hoped that the Board of Trade will meet the wishes of the electric lighting interest, and thus enable the public to get a little more electric lighting. Under the present conditions, it is absurd to expect capitalists to invest or consumers of gas to try the superior illuminant.

A VERY interesting illustrated article is contributed to our columns this week by Mr. E. P. Roberts, on the operations of the Brush-Swan Company, Cheyenne, Wyoming. Brush secondary batteries are in regular use there, with the encouraging results detailed. Mr. Roberts does not mention that he has had the superintendence of the work, and we therefore take pleasure in remarking that its success is largely due to the care and energy he has displayed in his duties. A full description, with cuts, of the Brush storage system was given in our issue of Oct. 4, 1884.

REPORT comes from Utica, N. Y., of another wonderful invention, by means of which remarkable results are obtained in long-distance telephony. The inventor is Mr. C. E. Allen, of Adams, Mass., who is assisted in his experiments by Mr. F. J. Callanen. It is stated that conversation is carried on over at least 800 miles of wire, and could be heard by persons standing at some feet from the receiver. The local newspapers speak of greater distances than 1,000 miles, but their descriptions, as usual, give no clue to the nature of the apparatus used at either end. It would be interesting to know a little more about the invention.

ON page 88 we give a very full special telegraphic report from our Chicago correspondent, of the proceedings of the Electric Light Convention, at the Grand Pacific Hotel, on Wednesday and Thursday of this week. We have been at considerable trouble and expense to get the report into this issue, but are confident that our readers will appreciate the efforts made as usual, to lay the information before them promptly and in good shape. It will be seen that several important questions were discussed by the Convention; and while nothing very new was brought to light, the result of such a gathering cannot but be beneficial. The chief feature of the proceedings is the organization of the National Electric Light Association, whose future deliberations may be expected to be valuable and interesting.

NEWS comes from England of the death in Australia of Dr. Edward Davy, whose name has been associated of late years with the earliest ideas of the electric telegraph as a practical thing. As far back as 1836 he is said to have conceived the possibility of the electric telegraph and to have experimented, but in 1839 he went out to Australia and thus failed to bring his work to fruition. A complete statement of his claims to priority was written some time ago by Mr. J. J. Fahie, in whose excellent work, "A History of Electric Telegraphy," three chapters are devoted to the subject. Dr. Davy was undoubtedly a most able man and one of the first in the telegraphic field. In a letter to his father, in 1838, he predicted that the government would eventually control the telegraph as a branch of the Post-Office system.

THE French papers devoted considerable space to the completion of the Mackay-Bennett system by means of the loop from England to France. According to the *Gaulois*, M. Cochery, Minister of Posts and Telegraphs, met with a good deal of patriotic opposition on account of the support he gave the system, planned and carried out by foreigners. "Happily he did not," it adds, "allow himself to be influenced. He understood the advantages which would accrue to France from the scheme, and has shown himself worthy of approbation as having the public interest at heart." The *Figaro* also pays the Minister a high compliment, couched in similar terms.

WE regret to learn that the system installed at Colchester, England, by the Southeastern Brush Company, and described in our columns on July 19, 1884, has been a comparative failure. The distinctive features of the system were the use of accumulators placed in favorable positions for reducing the length and dimensions of the conductors, and the reliance on underground distribution. Less than 2,000 lamps would not have paid, but the number called for by consumers does not appear to have exceeded 500 at any time. It is said that the candle-power of the lamps used was not at all high, and hence the charge of one cent per lamp per hour did not tempt householders.

WE note a funny case of mistaken identity in an Arizona exchange. It says: "The last mayor of New York was Edison, the electric light man, and when he told the politicians he was running the town, and not they, he was sent to jail for a fortnight. Edison can knock a dynamo out in one round; but when he tries to buck against the New York politicians, he is nowhere." This is as good as the item that went the round of the French papers lately, stating that Morse, the telegraph inventor, was a Belgian by birth, and had just died in Paris. After all, there is some excuse for the Hoboken sheet that says Mr. Weston, the inventor of the electric light system used by the United States Company, is about to enter upon another of those long walks in which his matchless endurance is so splendidly exhibited.

THE electric light may literally be said to have reached a higher point than any other means of illumination for buildings, from the fact that the great Washington monument, recently finished and "inaugurated" at the national capital, is lighted by electricity to within a very few feet of the top. The monument towers above every other building in the world, being 550 feet in height, and it is lighted by 125 sixteen candle-power lamps of the Weston type. Through the centre of the monument rises an iron frame-work guiding the elevator, and surrounded by the stairs leading to the top. The lamps are fixed to this frame-work at diagonal corners on each landing, and light up the interior so that the inscriptions upon the slabs contributed by various nations can be read distinctly. Then, within eight feet of the apex, a group of five lamps is placed. The leads consist of heavily-insulated Callender wires, and the lamps are fed by a Weston dynamo run by an Armington & Sims engine. It is fitting that electricity should be employed to light up this great memorial to the Father of his Country.

WHENEVER the public has a chance to express an opinion on electric lighting, it votes for the improvement, with both hands. The little episode at Newport, where a clique in the City Council tried to get rid of the arc lights and return to the use of gas, but was overcome by popular indignation, gave remarkable evidence of the high esteem in which the new method of illumination is held. Fresh evidence of this kind comes from Bethlehem, Pa. It was proposed to introduce 34 electric lights there for the streets of the borough, and the question was submitted by the local authorities to ballot. The electric light people made a vigorous canvass, and showed that the change would be beneficial. They did not minimize the fact that the use of electricity on the scale proposed would involve an increase in expenditure of $900 per annum, but they pointed out that far better service would be given. The result was: For the electric light, 755; against, 168—a majority for the light of nearly 600 out of a total of 900. The newspapers up to the day of the balloting were loaded down with correspondence on the subject, and one of the most effective appeals ever made in Pennsylvania Dutch put the case for electric lighting as follows: "Iss seller schreivver net zoo dick-keppich zu wissa odder zu admitta doss one electric licht on yedder kreutz shtroass mainer helling producea doot odder werd doss wee alleweil rousgepetzt konn werra aus dee 3 odder 4 aurma, schwache, klayna fierfuss gas lichter woss now on dee bletz shtayna unn woss hin kon g'shtellt warra. Es mauck ordlich keffer bei ziega, unn es kennt au en goot mittle sei for so keffer wee seller schreivver bei zu bringa in der helling so doss alla mensha sayna kennta woss mechtich klayna kepp so leut henn und wie g'schwind doss ihra nausa ferbrennt kennta werra." It is indeed "an gooty sign" when the stolid first settlers of the Lehigh region thus pronounce in favor of the electric light.

REVIEWS OF NEW BOOKS.

TRAITE ELEMENTAIRE DE LA PILE ELECTRIQUE. By Alfred Niaudet. Third Edition, revised by Hippolyte Fontaine, with an additional notice on accumulators by E. Hospitalier. 84 Illustrations. 8vo, 352 pp. Paris: Beaudry & Co. 1885.

Niaudet's treatise on electric batteries is so well known that a detailed review would be quite unnecessary, while the appearance of a third edition within a comparatively short time speaks better than anything else for the value of the book. Although it was even originally a good book, the revision and additions of M. Fontaine have added considerably both to its worth and contents, this last edition bringing it down to the present day, with all the latest forms of batteries. Appended to the book is a notice on accumulators from an industrial standpoint, by M. Hospitalier, which treats the subject in a clear manner, and gives the process of construction of several secondary batteries.

L'ANNEE ELECTRIQUE. By Philip Delahaye. Paris: Beaudry & Co. 1885.

This is the first volume of a series of annuals which are intended as a summary of every year's progress in the application of electricity to science and the arts. The author in the present volume touches lightly on what has been accomplished before the year 1884, but treats the latter year fully under the various heads of electric light, primary and secondary batteries, telegraphy, telephony, transmission of power, etc. The book is written in an easy, popular style, and makes a handy résumé of the past year's work in electricity.

Diehl's Incandescent Electric Lamp.

If platinum wire absorbs air, it accordingly forms a conduit for that gas to enter bulbs of incandescent lamps, and therefore the filament consumes and breaks as soon as sufficient air has entered. Mr. Philip Diehl, at the Singer Manufacturing Co. Works, Elizabeth, N. J., has, as before stated by us, broad patents on the application of the principle of induction to incandescent lamps. The lamp was exhibited at the late Philadelphia Exhibition, and visitors were very much interested to see the filament incandescent without any metallic or carbon connection between it and the source of electricity. One of the patents describes a lamp in which electro-magnetic induction is utilized, the base of the lamp occupying a position similar to that of the armature of a dynamo of either alternating or intermittent currents. The idea was so original, and the public, including the inventors, was so prejudiced against any removal of the platinum wire, and practical men thought it so theoretical, that the lamp was for some time looked upon as a mere curiosity; but when they saw it at the Exhibition, and when it was critically examined, it was seen to be something worthy of attention; so that at present it promises to become the foundation of a new system of electric lighting. Fig. 1 shows a sectional view and Fig. 2 an outside view of the lamp fitted to a standard suitable to be placed upon the table, or even to be carried from place to place within limits of the length of the wire. It may be mentioned that Mr. Diehl, who is busily occupied as the "inventor" of the Singer Company, devotes his leisure to electricity, of which he is an enthusiastic student, and in which he has made a great many other inventions, as well as curious and valuable experiments.

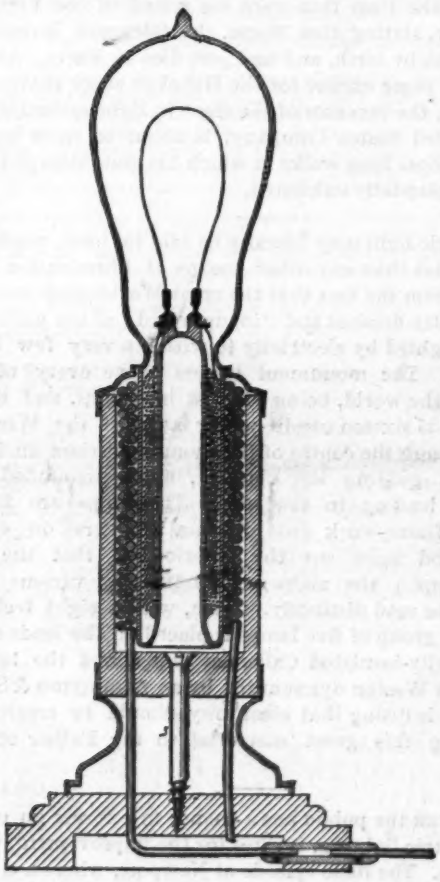


FIG. 1.

The Use of Hard-Drawn Copper Wire.

The subjoined are some of the instructions issued to linemen by the Baltimore & Ohio Telegraph Company regarding the new wire:

The hard-drawn copper wire used by this company, while possessing sufficient hardness and tenacity for its legitimate use, will not stand the rough handling to which iron wire may be subjected without injury.

In order, therefore, that danger of bruising or marring it may be avoided, while in transit or being strung, the following directions must be complied with:

Every coil should be examined before the sacking is removed. In case the covering is frayed or torn, the coil should be closely inspected to see that it has not been cut or marred from the same cause that injured the sacking. In case the wire is found to have sustained injury, the coil must not be used unless the injured portion can be easily cut out.

Coils of copper wire should never be thrown from a moving train.

While unreeling the wire, great care must be taken to avoid twists and kinks. Whenever a kink is found it must be cut out, and a good splice made. This also applies to splits or indentation of any kind.

In tying the wire to the insulator, the wire should not be tied so as to touch the glass. The tie-wire should first be put entirely around the glass, one twist made in it, then the line-wire brought up and the two ends of the tie-wire twisted around it, with at least five turns, thus leaving the line-wire without bends or kinks. When done, the projecting ends must be twisted off, using the pinching portion of the Helvin grip for this purpose.

Care should be taken that the hard-drawn wire be not stretched as tightly as iron wire under like conditions, that it may not be broken by contraction in cold weather.

Hard-drawn copper wire must always be joined with the Helvin splice, whether in constructing new lines, or in repairing breaks upon finished wires. No excuse will be accepted for the use of any other splice. Linemen must always carry with them a plentiful supply of the couplings.

Kansas City Notes.

To the Editor of the Electrical World:

SIR: Telegraphic construction and extension have been almost at a standstill in this vicinity and throughout the Southwest. The weather has been the coldest and most stormy of any winter within the memory of the "oldest inhabitant," and seriously interfered with all out-door work. The Western Union gangs were laid off early in the season, and have done but little or no work during the winter. The Union Pacific gang came in lately from the West, after being badly frost-bitten on the plains between this city and Denver, and are now browsing around "Battle Row" waiting for something to turn up. The Missouri & Kansas Telephone gang also have lost much time during the past two months, and were it not that their recent venture in a ball had netted them a dividend of 350 per cent., they would all be in arrears for their board and wash bills by this time. But with the advent of warm spring weather better times may be expected, and the outlook for new lines and extra-territorial work is rather promising for the coming summer.

The Kawsmouth Electric Company, of this city, using the "Thomson-Houston" system of electric lighting, could not stand the cold-water regulations of the temperance State of Kansas, in which they were incorporated, and have transferred their corporation franchises from that State to Missouri. They will in future be known under the name of the Kansas City Electric Company. This organization has been very successful under its present management, and the able superintendence of Mr. Weeks. Its capital is $100,000, all paid up. Its outside plant consists of about 10 miles of poles, and some 30 miles of No. 6 copper-covered wire. At this station, in West Kansas City, they have the following plant and machinery: Two engines, one of 75 horse-power and the other of 150; three boilers, one of which is kept in reserve in case of accidents to the other two; fourteen dynamos, as follows: five of 10 lights, one of 12 lights, and nine varying from 25 to 30 lights. The capacity of their plant is 260 lights in all, and they are at present running 200 lights, 30 of which are all-night lamps. The company are also experimenting on the Thompson & Rice system of incandescent lighting, to be used in connection with their arc system.

The other systems of electric lighting represented in this city are:

The Brush—G. Y. Smith & Co., dry goods, 16 lights; Plankington & Armour, packers, 40 lights; Fowler Bros., packers, 40 lights; Annondale Machine Shops, foundry, 16 lights.

United States—Hammerslough & Co., clothing, 10 lights.

Fuller Electric Light Company—Chapin & Gore, restaurant (the Delmonico of Kansas City), 10 lights.

The Fort Scott & Gulf Railroad people have moved their executive offices from their old quarters at Sixth and Broadway to their new and spacious building at Ninth and Broadway. The structure is four stories above the street level, with a sub-basement of two stories. It is built of brick, with terra cotta trimmings, and is elegant in its design and appointments. It is fitted throughout with water service, steam heat, elevators, pneumatic and speaking tubes, call-bells and telephones. The whole arrangement of the electrical devices was planned by Mr. Sprague, the efficient superintendent of telegraph for the company. Mr. Sprague had all wires for batteries and instruments run before the building was plastered, and they are now out of sight and reach. The operating room is a gem in itself. The instruments are all new, of the latest patterns, and from the well-known firm of J. H. Bunnell & Co., of your city. The switch-board is neatly mounted and arranged on hinges, so that it can be swung out from the wall and examined at any time. The tables are of the quartette pattern, black walnut, highly finished, and divided into compartments by plate glass half an inch thick. The main line wires terminate opposite the building at a very neat office pole, designed by Mr. Sprague. They are brought from the office pole to the switch-board through a 30-wire cable of the lead-covered pattern manufactured by the Western Electric Company, of Chicago.

The legislative Solons of Missouri are struggling with the underground system. Some electricians and engineers are in high glee, thinking that they will be called to Jefferson City as *experts* to give testimony before the committee.

It is known that some genius, of the long-hair type, has a workshop in a hay loft in the east bottoms, experimenting on the electrical railway theory, with a view of testing it in this city. But the snow and slush, on the Corrigan consolidated street car tracks, has been such as to preclude any efforts in that line.

The hard-drawn copper wire theory is finding favor in this direction, and Mr. W. W. Smith, the general superintendent of the Missouri & Kansas Telephone Company, has given orders to substitute 10 miles of this wire for the No. 8

FIG. 2.

now used on the territorial lines between this city and Leavenworth and this city and Topeka.

DYNAMO.

KANSAS CITY, Mo.

Progress of the International Bell Company.

The financial statement of the International Bell Telephone Company (limited) shows the following result of its business during the year 1884:

Receipts	f.1,196,041	say..	$239,208
Expenses, interest on bonds, construction, final payment to Russian government for concession, etc.	f.1,122,201	say..	224,400
Surplus	f.73,840		
Surplus from 1883	f.90,183		
	f.164,023	say..	32,805
Add first four months of 1885 at same rate			10,000
Surplus, May 1, 1885			$42,805

It is proposed, May 1, to pay a dividend of 2½ per cent. The total number of subscribers in Russia, Dec. 15, 1884, was 2,529. The company has other exchanges in Italy, Spain, Belgium, Holland, Germany and other European countries. Its capital is $1,700,000. The Continental Telephone Company of Boston has a large interest in this company.

Removing Boiler Incrustations.—Electricity is being advantageously applied in France, for removing the incrustations from boilers. The two poles of a battery of ten or twelve Bunsen elements are applied to the ends of the boilers, and after 30 or 40 hours the deposits fall from the sides to the bottom. When a boiler has been thus cleared the formation of new deposits may be prevented by applying a much less energetic current under the same conditions.

Electric Discharges Photographed Directly Without an Object Lens.

M. Mareschal, in a recent number of *La Lumière Electrique*, records some of the results obtained in photographing various forms of electric discharges directly upon a sensitive gelatino-bromide plate, together with the apparatus employed.

Fig. 1 shows the latter to consist of a square box, the sides of which are composed of plates of red glass, *ABCD*, which rests upon a plate of ebonite mounted on a foot.

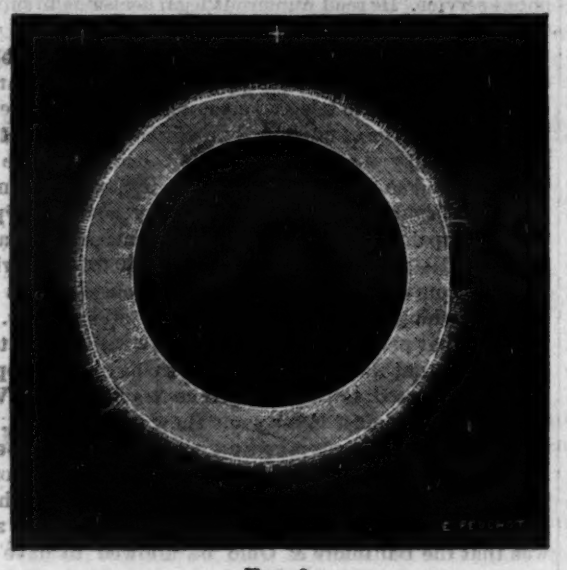


FIG. 2.

The top of the box *AB*, as well as the parallel sides *AD* and *BC*, are pierced by holes fitted with ebonite bushings, in which the brass rods *HLN* slide with gentle friction. In the foot of the table there is a rack, also of brass, which can be moved from without by means of a pinion, and is connected to the binding screw *E*, as shown. The top of the rack has a screw-thread cut on it so that a metallic or insulating plate can be attached to it. The rods *HLN* are also threaded so that their ends can be provided at will with balls, single points, combs and plates of metal or insulating material. This constitutes a transparent box, which acts as a barrier to photographic rays, into which electricity can be led by means of four conductors placed in pairs opposite or at right angles to

FIG. 4.

one another, and which can be brought together or separated from the outside.

This simple arrangement answers all requirements, and by placing the sensitive plate near the conductors, the electric discharge is photographed directly and literally under the eyes of the operator.

The source of electric energy consisted of 6 bichromate of potash cells, giving 15 ampères at 10 volts. This current was transformed into one of high tension by means of a large induction coil giving sparks not less than 20 centimetres in length. Even the discharge of a Holtz machine was obtained, as shown in Fig. 4, each experiment lasting less than a second.

Figs. 2 and 3 represent the discharge produced under the following conditions: The plate *P* was of metal and connected with the negative terminal of the induction coil. Upon this there was placed a photographic plate with the sensitive film facing downward, and consequently touching the plate—whence the dark circle in the centre of the figures. This photographic plate was then completely covered by a thin sheet of ebonite, above which a second similar sheet was placed, separated from the first by small wedges,

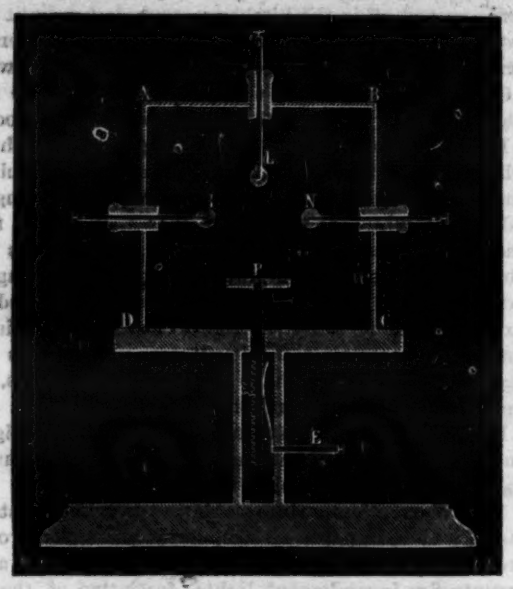


FIG. 1.—PHOTOGRAPHING THE ELECTRIC DISCHARGE WITHOUT A LENS.

so as to leave a layer of air between the two. Finally another photographic plate, with the film above, was placed on top of the second sheet of ebonite, and the whole was topped off by a metallic plate connected with the positive terminal of the induction coil by the conductor *L*. An inspection of Figs. 2 and 3 shows that the forms of the discharge from the two poles are not alike. Thus the positive pole shows quite a large crown surrounded by a kind of aurora composed of an infinite number of very delicate rays, while that at the negative pole seems to have spread very little. The same thing is demonstrated by Fig. 4, which represents the discharge obtained by means of a Holtz machine, but this was taken in a horizontal position. The plate was placed on the non-conducting plate *P*, with the sensitive film above, and the discharge passed between the two balls *H* and *N*. Here, again, it will be seen that the principal display is at the positive pole, while that at the negative pole is contracted and seems to flow into the other. The conducting balls were separated a distance of 9 centimetres, and the spark flashed between them at the breaking of the primary current.

In Fig. 5 the spark obtained under nearly the same conditions may be studied. The balls *H* and *N* did not rest directly upon the sensitive film, but upon two small sheets of tinfoil, pasted at the end of the plates about 15 centimetres apart. In this case the source of electricity was not the Holtz machine, but the induction coil. Two nearly parallel sparks were obtained; they will be seen to be very complex, each one seemingly composed of four lines of different thickness entwined among one another, and presenting a variety of curves. Beyond the spark the plate is marked for a distance of 9 centimetres by curved lines running from pole to pole, and exhibiting many ramifications.

Fig. 6 represents a discharge obtained under the following conditions: The plate *P* being metallic and connected to one of the poles, there was first placed upon it a thin

FIG. 6.

sheet of ebonite of the same size as the photographic plate; upon this was laid the photographic plate with the film above. The film was then placed in contact with the upper conductor *L* ending in a ball, which was connected to the other terminal of the inductional coil. It will be seen that, notwithstanding the two intervening dielectrics (ebonite and glass), and notwithstanding the non-transparency of one of them, the discharge produced around the plate *P* was very sharply reproduced in the form of a circle similar to those observed in Figs. 2 and 3. It will be noticed that around the ball there are produced an infinite number of ramifications in all directions, and the path of the spark can be traced in two opposite directions as it passes around the photographic plate from the ball to the metal plate. It will also be remarked that the two principal lines are accompanied by two others, very pale, but much larger, and the curvatures of which are not parallel to the former.

The results of these experiments are very curious. The position of the plates was varied in eighteen different ways, as well as the form of the conductors, but only the

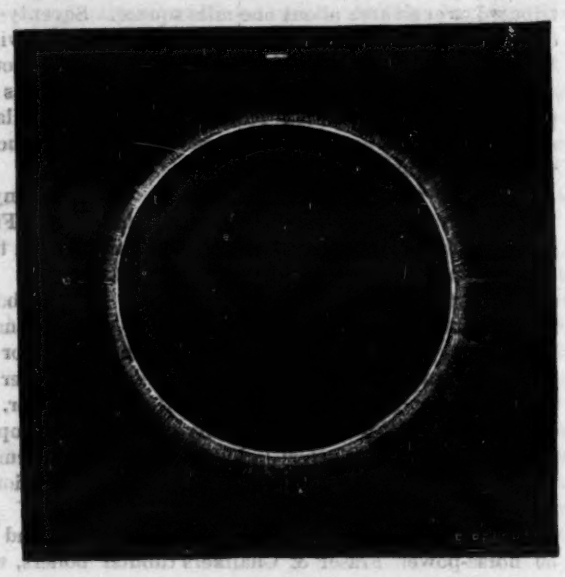


FIG. 3.

more interesting results are shown here. We may add that all the skill of the draughtsman's and engraver's arts fails to bring out all the details of the original plates.

Allegheny Notes.

The Allegheny County Light Company, Pittsburgh, Pa., have elected the following officers for the ensuing year: President, Joseph S. Brown; Vice-President, John E. Ridall; Secretary and Treasurer, Robert D. McGonnigle; Superintendent, S. A. Duncan. The company have placed electric lamps on the new north side bridge. The suspension bridge has been illuminated by this company for some time.

They now have a portable apparatus in use for the erec-

FIG. 5.

tion of a skating rink, upon which work is being done both night and day.

An ordinance has been offered in Common Council requiring the removal of all telegraph, telephone and electric light poles. Considerable opposition has been presented to it, and it is now in the hands of the city attorney for his opinion as to the power of council on the subject.

General Manager Henry Metzgar, of the Bell Telephone Company, has lately been at Harrisburg, to appear before the Committee on Municipal Affairs against the act offered by Representative Bennett, requiring all telegraph poles to be removed within one year. The committee will meet again to hear the arguments for and against the proposed legislation. It is thought that the arguments advanced against the proposed measure will be sufficient to justify the committee in reporting the bill negatively.

Storage Batteries in Commercial Use.

BY E. P. ROBERTS, M. E., MEMBER INST. ELEC. ENG.

The Brush-Swan Electric Light Company, of Cheyenne, Wyoming, was formed in the fall of 1882, and was the first Brush-Swan company formed to use the Swan incandescent lamp in conjunction with the Brush storage battery and arc system. The arc-light system commenced operations in 1882; and by the fall of 1883 about thirty batteries were in use. There are now ninety-five batteries furnishing light for more than thirteen hundred lamps, distributed over an area about one mile square. Seventy-five customers use the light, among whom are the following: Two churches, two banks, two club-houses, opera-house, stores, hotels, printing office, saloons, gambling houses and private residences. It will readily be seen that a large number of special arrangements are desirable with such a variety of requirements.

Owing to the experience gained by this company, a description of their plant may be found interesting. First, general mention of the entire plant will be made, and then elaboration given to the incandescent plant.

The station is divided into five parts, namely, boiler room, with coal shed adjacent, engine room, dynamo room, pump adjusting room, and sleeping rooms for the engineers and firemen. The sleeping rooms are over the engine room; all other rooms are on the ground floor.

It may be mentioned incidentally that a gas company competes with the electric light company; that Siemens' regenerative burners are used, and that opposition is briskly maintained.

The boiler power consists of one 80 horse-power and two 50 horse-power Fraser & Chalmers tubular boilers, with feed water heater, pump, injector, etc.

The engines used are one 65 horse-power Fraser & Chalmers Corliss, running one 40 and one 30-light dynamo; one Fraser & Chalmers 40 horse-power slide-valve, running one 65-light machine, and one Westinghouse 55 horse-power automatic running another 65-light dynamo. The Corliss and slide-valve run to counter-shaft on pillow blocks placed on stone foundations, and the Westinghouse runs direct. The 65-light and 30-light dynamos are the two new sizes formed by using the new Brush armature in the old 40 and 16-light machines respectively.

Lamps of 2,000 candle-power are used. Extra lamps are kept adjusted, and immediately upon complaint, a poor lamp is replaced by a good one. A watchman is employed to look after the lights all night.

A Sterling switch-board is used, and found very convenient. By it any circuit can be connected with any dynamo, circuits looped together, or any other desired change made with ease and celerity. The Sterling indicator is also used instead of a pilot lamp. It is much better and takes practically no power.

A lightning arrester has been found indispensable. The lightning in the spring is terrific. One afternoon of last year fifteen flashes came in over the wires. A magneto tester is used for testing for grounds and open circuits. A galvanometer and battery are used for testing for poor connections. A telephone with a large gong, worked by local battery, is in connection with the telephone central, and with the company's office.

The lines are carefully run; on every block each wire has a small tin tag attached, giving the number of the circuit, and the direction of the current. Maps of each circuit are kept at the office for ready reference.

Prices obtained for arc lighting are as follows: 50 cents per light until ten o'clock; 60 cents until twelve o'clock; $1.00 all night; and for twenty-two city lights, burning all night, each and every night of the year, $5,000 per annum for three years.

BATTERY PLANT.—On each block—sometimes on every two blocks—is located a small portable house (see illustration), in which are placed all the batteries furnishing light for said block. A partition divides it into two parts, one for the batteries and the other for the meters and switch-board. A plug switch is used in order that any combination may be readily effected. Cable connections permit coupling batteries together as desired. An extra battery is kept in each house for use, in case extra light is required.

The batteries are placed on string pieces 2 inches by 4 inches by 10 feet; each cell rests on four porcelain insulators, and the string pieces rest on Western Union insulators with pins set in cross pieces. Three sizes of batteries are used, 1, 2 and 3, with capacities of 20, 40 and 80 lamp hours respectively.

Three charging circuits are used, two to private residences, where No. 1 and No. 2 batteries are used, requiring from 7 A. M. to 1 P. M. to charge them with a 10 ampère current, and one circuit to the business part of the city, where three batteries are used. As these batteries are much larger a longer time is required to charge them, and, therefore, they are charged from 7 A. M. until 3 o'clock P. M. by a 65-light dynamo. They are then connected by switch, as desired, for the night, in some cases three batteries being connected for quantity.

At dark the charging circuit is looped in with the all-night outside arc circuit, and the charge thrown on about twenty meters, and by the connections for quantity controls about fifty batteries; thus they are left until daylight, when the arc circuit shuts down. By this means the batteries obtain considerable charge; they are then disconnected and charged separately during the day.

The following brief mention may be made of the arrangements for lighting special places:

At the manager's house several convenient devices are used. A light is placed outside the front peak of the house, and is controlled in the front hall. The cellar light turns on and off in the kitchen; one bedroom light is controlled by a switch close to the bed. Attachments are made in two rooms for a sewing-machine motor—which is a Griscom motor, run by the same current as the lamps. Lights also are placed in the coal-house, chicken-coop, etc.

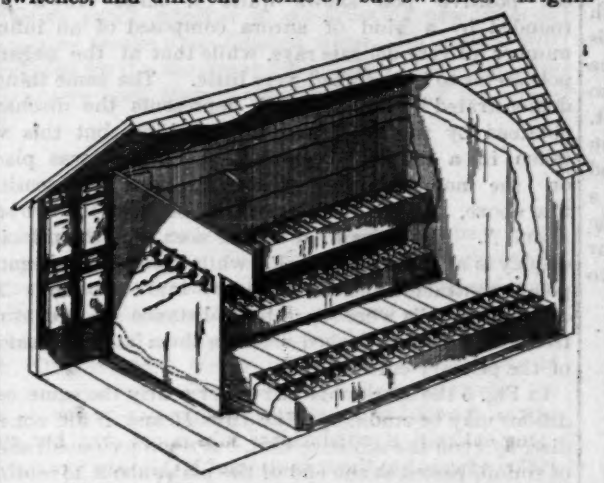
In the main auditorium of the Congregational church—which in form is like that of a theatre—are three circuits; one for a 25-light chandelier, the second supplying eight side lights, while the third furnishes four lights for the choir. Below are the Sunday-school rooms, class rooms, library, and the pastor's study. Here, the ceiling being rather low, the main Sunday-school room is lighted by six fixtures, made to bring the lights close to the ceiling, and they have porcelain conical reflectors around each set of lights; the class rooms have similar arrangements, and in the pastor's study a chandelier is used.

Each circuit has a switch-board to turn the lights on and off in convenient sets, excepting the study and hall lights, which are controlled at the fixtures.

The Warren emporium, a large mercantile establishment, which, in point of size, finish and stock, would do credit to a much larger city, is lighted by eleven arc and seventy-five incandescent lights, forty-two of the latter being run on the arc circuit, while the remainder are fed by a battery. Arcs are used in the exhibition rooms, packing departments and cupola, and incandescent lamps in the clock tower, parlors, offices, vaults, workshop and cellar.

In a jewelry store the lights are placed close to the silverware and jewels, and the effect obtained is very fine.

In one gambling establishment, consisting of an entire two-story building, the lights are controlled by main switches, and different rooms by sub-switches. Magnifi-



MOVABLE HOUSE FOR SECONDARY BATTERIES.

cent crystal chandeliers are used, each light being surrounded by pendants.

A rather curious experience has fallen to the lot of the Cheyenne Company, in that when they started there was no gas company. Electric light company stock was owned by four men who have always been successful in Cheyenne, and consequently many men were opposed to them. About this time a gas company prospector appeared in town, and finally succeeded in forming a company. A large number of stockholders were enrolled, and by thus distributing the stock a number of customers was guaranteed. They started with a very fair quality of gas, and the electric light customers became somewhat difficult to deal with.

A bid was called for from the city for lighting the streets, and each company was asked to state the number of lights it would maintain for the sum of $5,000 per annum on a contract for three years. The gas company bid 135 lights of "customary (?) candle-power," and the electric light company bid 22 2,000 candle power lights. The subject was a matter of discussion for several days. The Common Council awarded the contract to the electric light company. In the meantime, the incandescent light became more satisfactory, and the gas had deteriorated. Now, the electric light company are refusing orders, because of lack of power. Two of the largest gas-company stockholders have electric lights in their houses, and two of the largest consumers are now using electric lights.

Telephone Matters in Massachusetts.

The hearing of the petition to the Massachusetts Legislature, of the American Bell Telephone Company, for an increase of the amount of the capital stock, has been fixed for March 4.

The committee on mercantile affairs gave a hearing on Feb. 17 on the petition of parties for restriction on the rates charged by the American Bell Telephone Company. The counsel present were: William B. Gale for the petitioners, ex-President Bruce and John E. Hudson for the Bell Company, Parker C. Chandler for the Baltimore & Ohio Telegraph Company, and William H. Bent for the New England Telephone Company. The case was opened by Mr. Chandler, who argued that telephone companies should be obliged to make connections with all telegraph companies. He complained that the Baltimore & Ohio was not permitted to have telephone connection with the Bell Company's system. He argued that there was a popular distrust of the Western Union Telegraph Company, as appeared at the last election, when the supposed manipulation of news by that company almost resulted in a riot in New York. He said that the Baltimore & Ohio was the only barrier between the public and a powerful monopoly—the Western Union and its alliance with that perfect monopoly, the American Bell Company. Other States, he said, had refused to become parties to the theory that one company may control telegraph or telephone service. He read numerous legal decisions to support the point that in Western States the leaning of the courts has been in the direction of greater freedom, and of the decision that a telephone company is a common carrier. He asserted that the telephone companies make more free with the property of citizens than any other corporations, except, possibly the telegraph; they endanger life and property, and should serve the public without discrimination. He spoke of the Bell Company as "this pampered company," "the favorite corporation," and asked if it dared stand up and deny to its 30,000 subscribers rights to connect with such telegraph companies as they choose, which rights are granted in other States. He believed that privately the Bell people would admit to the committee that they would be glad to have the proposed legislation passed, but under their contract with the Western Union they must make some show of opposition. He believed that there was a contest coming between the Bell Company and the Western Union, in which the former would try to throw off the restrictions with which the Western Union throttled it a few years ago. All he asked was that the Baltimore & Ohio be allowed to have connection with the Bell Company's system. If the Bell proposed to deny this small privilege, he would like to be heard on the petition of the Bell for an increase of its capital stock to $20,000,000. If they would be brotherly, he would be; but if they want the whole world, he wanted to be heard in opposition.

H. C. Bolles, agent of the Baltimore & Ohio Telegraph Company at New Bedford, was the first witness called, and testified that the company had been refused connection with the Bell Company, and that numerous citizens had asked for such connection and had been refused. Mr. Bruce said that there was no dispute as to the facts that, under its contract with the Western Union, the Bell Company had refused connection with the Baltimore & Ohio. Charles W. Clifford, of New Bedford, representing the Southern Massachusetts Telephone Company, cross-examined Mr. Bolles, and the latter said that he admitted that there was no other course than for the telephone, which was in the Baltimore & Ohio office, to be taken out, though it had not been taken out yet. He said the telephone people had been very fair with him. H. W. Kilbourne, superintendent of the Boston District Telegraph Company, said that the Bell Company had refused to put in a telephone for the use of the District Company, though it would be glad to do so, on account of its contract with the Western Union Company. The District Company is in the service of the Baltimore & Ohio and the Commercial Cable Company. A. G. Ryder, agent of the Baltimore & Ohio at Taunton, testified to the same effect as the New Bedford witness. O. L. Barron, the Baltimore & Ohio agent at Gloucester, said he had a telephone in his office and was not supposed to use it, but he did use it. Mayor Donovan of Lowell testified that the Baltimore & Ohio in Lowell had been refused telephone connection.

The Lowell *Times* of the 21st reports the proceedings of the 18th as follows:

Mr. Bruce, for the Bell Telephone Company, said he would not have thought it necessary to say anything before the committee, if it had not been for the character of the remarks of Mr. Chandler against the company. That gentleman had seen fit to publicly charge that the Bell directors had gone before the Legislature and secured a charter which expressly exempted them from section 10 of the law in regard to telegraph companies. It was only necessary to state, the Bell Company did not make the contract with the Western Union, it found it made when the company was organized, and as honorable men the directors of the company have simply refused to violate it. Such conduct was to be commended rather than held up to censure. The company only desired to have the committee know its true position and left the decision of the question in their hands without argument. The hearing was postponed until next Thursday.

The Telephone Subscribers' Union, a rapidly growing association, organized for the purpose of securing legislation to limit and regulate telephone rates, was represented before the committee by Wm. B. Gale, Esq., and N. D. Pratt, Esq., who asked that the hearing on the petitions of Messrs. Mahoney, Morse and others should be postponed until March 4, that being the date previously fixed by the committee for hearing on the American Bell's petition for an increase of capital to $20,000,000. This request was granted by the committee, who assigned the hearing for the date requested, thus to follow immediately on the increase of capital hearing.

Col. J. H. Benton appeared on the order introduced by Senator Scott in relation to establishing a State commission for the regulation of telephone rates, etc., and stated that he believed it is high time that the existence of gigantic telephonic monopolies should be recognized by the Legisla

ture of this commonwealth by the passage of some kind of legislation in the interests of telephone subscribers. He also announced that an order had been introduced into the Senate authorizing the committee to send for persons and papers at the hearing. This hearing, like the others, was fixed to come up March 4.

Edison's Telephonic Inventions.*

BY PROF. EDWIN J. HOUSTON.

(*Continued from page 76.*)

The use of the induction coil, with any form of variable resistance transmitter, marks a great advance in telephony. The maximum variation produced by the voice in the resistance of any transmitter must, necessarily, form a comparatively small portion of the total resistance of the main line with all its instruments. When, therefore, the direct battery circuit is employed on the main line, the variation produced in the strength of the current by the transmitter must necessarily be weak, and the sounds produced by the receiving instrument, at the distant end of the line, correspondingly weak. But when the battery is short-circuited, through the variable resistance and the primary of the induction coil, the variations in the resistance produced by the voice are comparatively great, and corresponding variations are sent over the line by means of the induced currents set up in the secondary coil.

Then, too, if the resistance of the secondary coil be made comparatively great, the induced current will have a high electromotive force, and the influence of an increased resistance, due to great length of line, will be much less. The use of the induction coil may, therefore, be regarded as marking a decided era in telephony. It is scarcely necessary to add, in this connection, that the systems of telephony in general use are greatly dependent for their successful operation on the employment of induction coils.

The uninsulated rheostat transmitters shown in Figs. 3 and 4 were modified by Edison in a variety of ways. For example, the rheostat was given the form of a long, thin platinum wire, wrapped in a spiral form around the outside of a cylinder of some insulating material, and so placed that the forward movement of the diaphragm causes the metallic spring to successively short-circuit each convolution of the wire rheostat, thus decreasing the resistance of the circuit.

FIG. 7.—EDISON'S CARBON TRANSMITTING TELEPHONE (EARLIER FORM).

In another form of rheostat transmitter, a coil of uninsulated wire is loosely wrapped around a vertical insulating support, so that the movements of the diaphragm produce a compression or elongation of the spring, and thus throw its successive convolutions into or out of the circuit.

Although articulate speech was obtained by the use of the rheostat transmitters described above, yet the effects were by no means of a satisfactory character. Instead of the resistances being gradually varied by the movements of the transmitting diaphragm, they were thrown in abruptly. The diaphragm would move so as to cut out one of the resistances, thus throwing a sudden variation on the circuit. Then no further variation would occur until the diaphragm had reached the next contact point, when another sudden variation would occur. It therefore followed that the speech reproduced by the receiver was confused and often unintelligible, and quite deficient in either its finer modulations of intensity, or in its quality.

These difficulties were obviated by the invention of what Edison terms his "articulators, or electric tension regulators." These consisted essentially of tufts of fibrous materials, such as asbestos, sponge, cotton, wool, feathers, or silk, coated or covered with a thin layer of any electrical conducting material, such as plumbago, metallic powders, etc. A small quantity of any of these materials so prepared, placed loosely together between two rigid plates so as to be compressed by the forward movements of the diaphragm, will gradually, but markedly, vary the electrical resistance of a circuit in which it is placed.

The following description of one of these "articulators" will serve to render the preceding clearer. The fibrous material is preferably elastic, so as to avoid permanent compression during use. For this purpose silk is chosen. The unspun fibre is cut in lengths of, say, the one-sixteenth of an inch, and coated with plumbago, either by rubbing or otherwise. The fibres are then rolled together with a little loose plumbago in a cigar shape, and retained in shape by a few binding fibres of silk.

The fibre rheostat so obtained is then placed at *f*, Fig. 6, between the adjusting post *d* and the diaphragm *b*. The adjusting post *d* is provided with a metallic plate *e*, connected to one of the terminals of the circuit. The diaphragm *d* is made of mica, and is provided with a conducting plate or spring *c*, which through the conducting spring *a* connects it with the other pole of the battery. The "articulator" *f*, therefore, is inserted as a variable resistance in the circuit. Any movement of the diaphragm will result in producing considerable variations in the resistance in the circuit, due to the variations in the pressure on the bundles of conducting fibre.

Since these variations are due to the number of conducting points on the surface of the fibre that are brought into contact by the increased pressure of the diaphragm, the variations in the resistance must necessarily be of a gradual character, in contradistinction to the abrupt variations effected by the first form of transmitter.

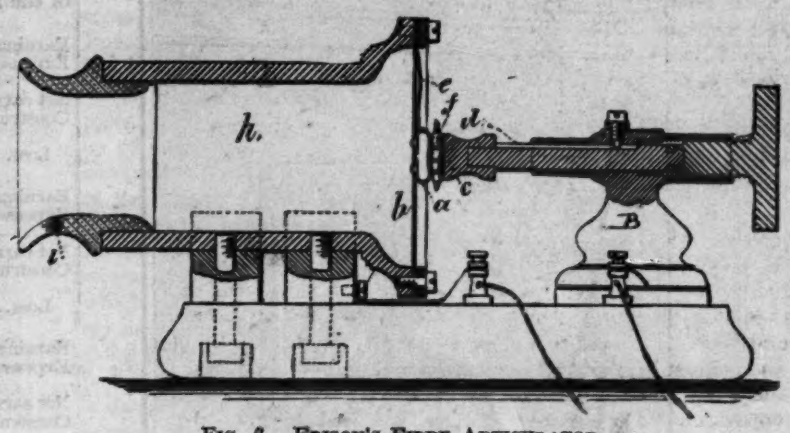


FIG. 6.—EDISON'S FIBRE ARTICULATOR.

The mica diaphragm, first employed for telephones by Edison, possesses, it is claimed, many advantages over the ordinary metallic diaphragm. Its advantages over any of the old forms of membranous diaphragms employed by Reis are evident, since the mica is not as much effected by the moisture of the breath, or by changes of temperature. Its advantages over the metallic diaphragms are not, however, so apparent, since, being composed of a number of more or less parallel plates of varying thickness and elasticity, it is difficult to see how such a plate could as freely accept the rapidly varying rates of the vibrations of the sound waves, as could a homogeneous, highly elastic, metallic plate of uniform thickness.

The aperture at *i*, in the mouth-piece, is provided so as to avoid the hissing sounds produced by many of the consonants.

From transmitters in which the resistances consisted of elastic non-conducting materials, more or less covered with conducting substances, the step to resistances consisting entirely of conducting substances was but natural. This step led to the invention of Mr. Edison's carbon transmitter, which must be regarded as an extremely valuable contribution to telephony.

Edison tried numerous experiments with variable resistances, consisting throughout of solid conducting materials, before he fully demonstrated the valuable properties possessed by carbon in its various conducting forms. One of his earlier forms of carbon telephone is shown in Fig. 7.

The cap 10 serves to hold the diaphragm firmly at its edges. A piece of cork or rubber tube is secured to the middle of the diaphragm. This tube is adjusted so as to rest against an ivory disc, provided on its outer face with a platinum disc. An adjustable rod 5 is also provided at its upper end with a platinum disc. Between these two platinum discs is placed the carbon rheostat, which in this case is composed of a button of lamp-black carbon 6. The two platinum discs serve as conductors, by means of which the carbon rheostat and the primary wire of an induction coil are included in the circuit of a battery. An adjusting screw 3 is provided for regulating the pressure on the carbon rheostat.

By numerous experiments Edison found that carbon of high electrical resistance is not as well adapted for a rheostat as is carbon of a higher conducting power, since with very high-resistance carbon the movements of the diaphragm by the action of the sound waves would not produce the requisite change of resistance. He at first sought to increase the conducting power of the carbon by mixing other substances with it so as to separate its particles, but found that treated in this way its resistance became too great to permit its use in connection with the primary circuit of an induction coil.

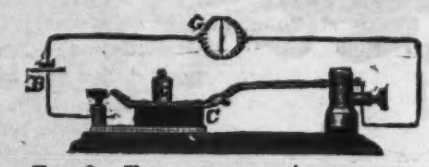


FIG. 9.—EXPERIMENTAL APPARATUS.

Fortunately, however, he discovered that the variety of carbon produced by the imperfect combustion of such light hydrocarbons as gasoline or naphtha was capable of undergoing considerable changes in its conducting power when submitted to variations of pressure.

The carbon button is prepared as follows, viz.: The darkest portions of the carbon obtained from the soot of burning naphtha, as before mentioned, is selected, and the mass then subjected to a powerful pressure so as to effect a consolidation. This button is placed in the telephone in the manner shown in connection with Fig. 7.

The success attained by Mr. Edison's telephone resulted from the fact that the variations in the resistance of the carbon button under variations of pressure, being dependent entirely on the pressure, varied directly with it. The use of the cork, or rubber disc 8, is intended to prevent the continuance of the vibration of the plate under the action of the voice, after the tone of the voice causing a particular vibration has ceased to act. In this way the distinctness of articulation is very greatly improved.

The use of this rubber tube, however, gave rise to the necessity for continual readjustment, due to its gradual change of shape. To avoid this difficulty, Edison replaced this rubber tube by a short spiral metallic spring formed of a few turns of stout wire. This modification is shown in section in Fig. 8.

The mouth-piece *b* is furnished with a stout diaphragm *k*, firmly secured at its edges in the manner shown. The centre of this diaphragm, on which the carbon button *c* rests, is platinized in order to insure a good contact. The button formed of prepared carbon is placed on the centre of the diaphragm inside a metallic ring *g*, and is surmounted by a metallic plate *d*, held in position against the button by the spring *e*, formed of a few turns of stout wire. The pressure exerted by the spring *e* against the metallic plate *d* is regulated by means of the screw *e*. The carbon button *c* is placed in the circuit of a battery by means of the conducting wires placed on the left side of the figure.

Since the ring *g* and the circuit-regulating devices are supported on the middle of the diaphragm, it is evident that when the diaphragm is set into vibration by the sound waves, the variations in the resistance of the carbon button are influenced by the inertia of the ring and the circuit-regulating devices.

This form of instrument was found in practice to possess a disadvantage, owing to the fact that the tendency of the spring to a definite rate of vibration caused it to produce a musical note that interfered with the distinctness of the articulation. It was in his attempt to remedy this defect that Edison was led to the discovery of a principle of great importance to the successful use of the carbon telephone.

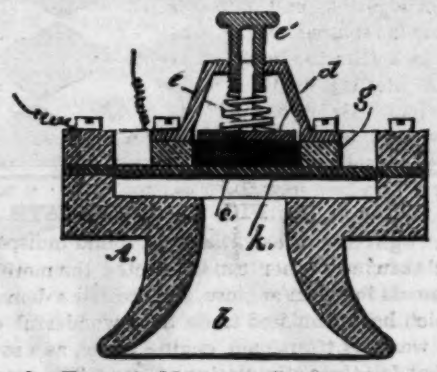


FIG. 8.—EDISON'S MODIFIED CARBON TRANSMITTER.

Attempting to avoid the musical note emitted by the spring, he made it of thicker and thicker wire, when he found the clearness of the articulation to become greater and greater. This showed that the increase in the inelasticity of the spring had no effect on the articulation. He inferred, therefore, that since the springs were unnecessary, the action of a transmitter did not require the sound waves to produce an actual vibration of the diaphragms. When the sound waves struck the diaphragm they produced a direct variation of pressure thereon, and thus varied the resistance. He used diaphragms, therefore, that were so thick that the loudest sounds produced no sensible vibrations therein, and fastened the carbon disc and plate tightly together. By these means very excellent results were obtained.

The effects produced by variations of pressure on the conductivity of carbon are well shown by means of the apparatus seen in connection with Fig. 9. The circuit of the battery cell *B* has inserted in it a galvanometer *G* and a carbon button *C*. The circuit being closed, the needle of the galvanometer showed a certain deflection. If, now, the weight *G* be placed on the carbon in the position shown, the current of the galvanometer is at once deflected by a more powerful current, thus showing that the resistance of the circuit has been decreased by the increase of pressure. A further addition of weights results in a greater decrease in the resistance of the circuit.

(TO BE CONTINUED.)

Electro Deposit of Nickel on Zinc.—In coating zinc with nickel, by means of a galvanic current, the zinc must first be cleaned by diluted hydrochloric acid and thoroughly washed. It is then hung in the nickel bath for a short time, taken out, rinsed, and thoroughly scraped, so as to remove all the metal that does not adhere firmly. This operation is repeated till the zinc is covered with a thin film of nickel, which can afterwards be made as thick as required. The suitable current strength is easily found; and when the zinc is once thoroughly covered, the current may be increased without any risk of the nickel peeling off.

* Journal of the Franklin Institute, February, 1885.

Gas Engines for Electric Lighting Purposes.

The attention of our readers has often been drawn to the improvements which the advent of electric lighting has brought about in the steam engine, and our articles descriptive of a number of the latter give a good idea of the influence which a new industry exercises upon an old one. Indeed, one may reasonably claim that the electric light has more than any other cause effected the more recent improvements in steam engines, and created a demand for them which has stimulated trade to a wonderful extent.

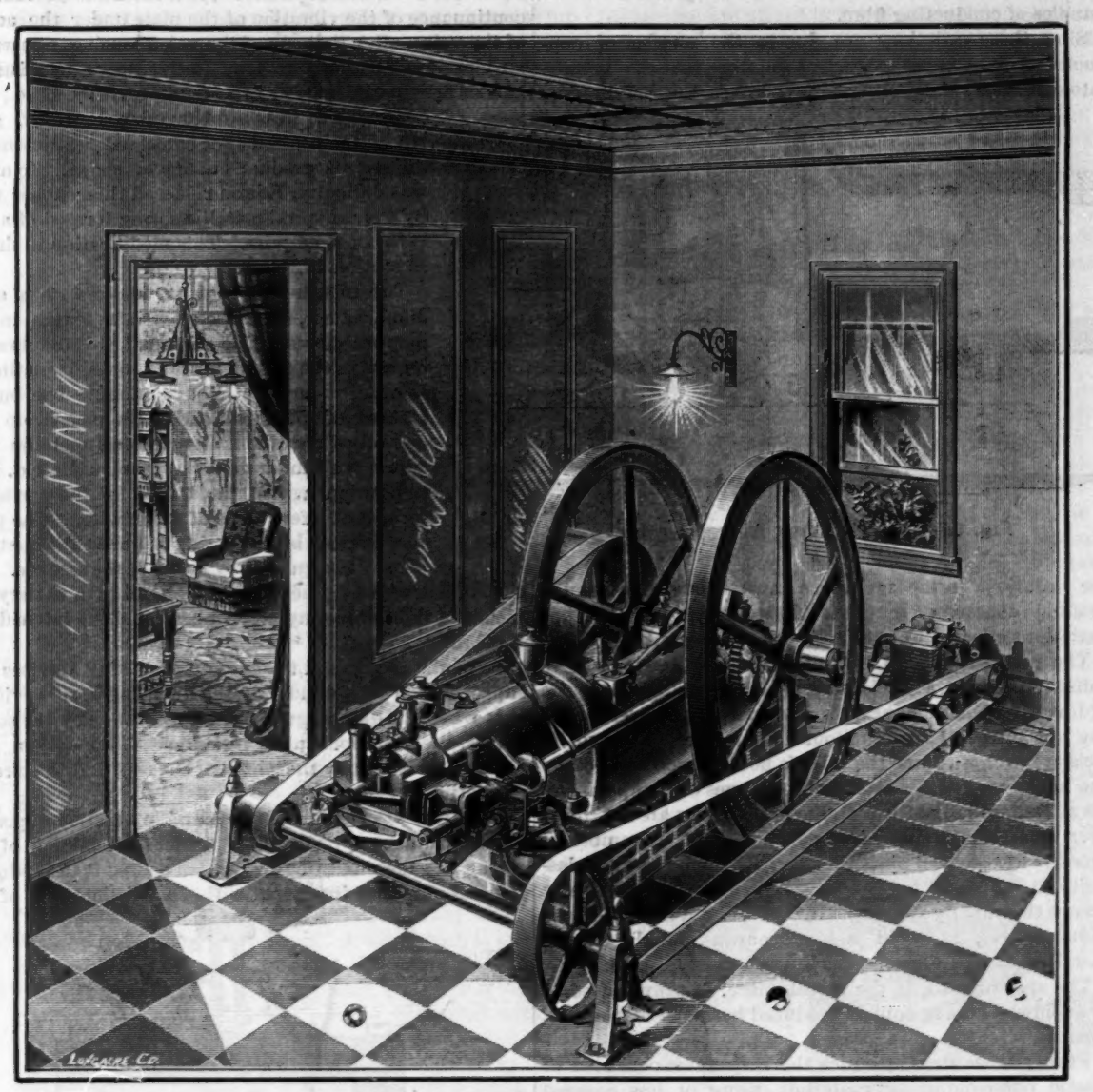


FIG. 1.—A PRIVATE ELECTRIC LIGHT INSTALLATION.

But it was not the steam engine alone, as a source of power, that felt these stimulating effects. The gas engine also has responded to the influence, and has been forced, most successfully, to adapt itself to the new conditions imposed upon it. The well-recognized advantages of the gas engine make it peculiarly valuable for private installations, and the success which has attended them in such situations gives promise of an increased application in the future. We need point out only the prominent attributes of the gas engine to show that, under ordinary conditions, it presents the most convenient form of domestic motor. In the first place, it requires no attendance after being started, and can be set in motion at the required time without any delay whatever. It consumes fuel, in the shape of gas, only during the time it is at work, and all expense ceases the moment the engine is stopped. Thus, for intermittent work, the gas engine may be said to stand without a rival, while its efficiency, which far exceeds that of the steam engine, gives it an additional value from a theoretical standpoint.

One of the most successful of gas engines in use in this country is the "Otto Silent," which has long been before the public and which has lately been improved so that the objections formerly raised against its use for lighting purposes no longer apply. The single-cylinder engine of this make has been successfully used in this country and in Europe, both for running dynamos directly and for charging secondary batteries during the day, from which electricity is drawn at night to light incandescent lamps. In the accompanying illustrations, Fig. 1 shows a private installation of a gas engine and dynamo running a system of incandescent lamps.

Heretofore gas engines have, to a great extent, been built in sizes rarely exceeding 10 to 15 horse-power; but in order to comply with the constantly increasing demand for gas engines of higher power, Messrs. Schleicher, Schumm & Co., of Philadelphia, have recently constructed a modification of the Otto gas engine, which is represented in the accompanying engraving. The Otto "Twin Engine," as it is called, is manufactured in sizes over fifteen horse-power only. The engine is noteworthy for its symmetrical arrangement. The pulley being placed centrally between the main bearings, will naturally be better prepared to resist the strain of the belt than if overhanging on one side next to the fly-wheel, while the use of the crank-discs, also in proximity to strong bearings held by a solid frame, are preferable for the double crank shaft. The gear-shaft of the engine is moved by a gear-wheel and pinion placed between the right-hand fly-wheel and pulley, and extends through the frame. It gives motion to the slides by means of a crank-pin at its extreme end and between the frame and the casting, connecting both cylinder heads, and causes the sleeves and cams to operate the gas inlet as well as the exhaust valves. The governor also receives motion from this shaft.

The engine is so constructed that either one or two cylinders may be run by simply shutting off the gas leading to one cylinder. Where loads vary within large limits this may offer advantages. The object of the combination of two cylinders in one machine is to obtain an impulse every revolution when fully loaded, and to obtain thereby steadiness in running.

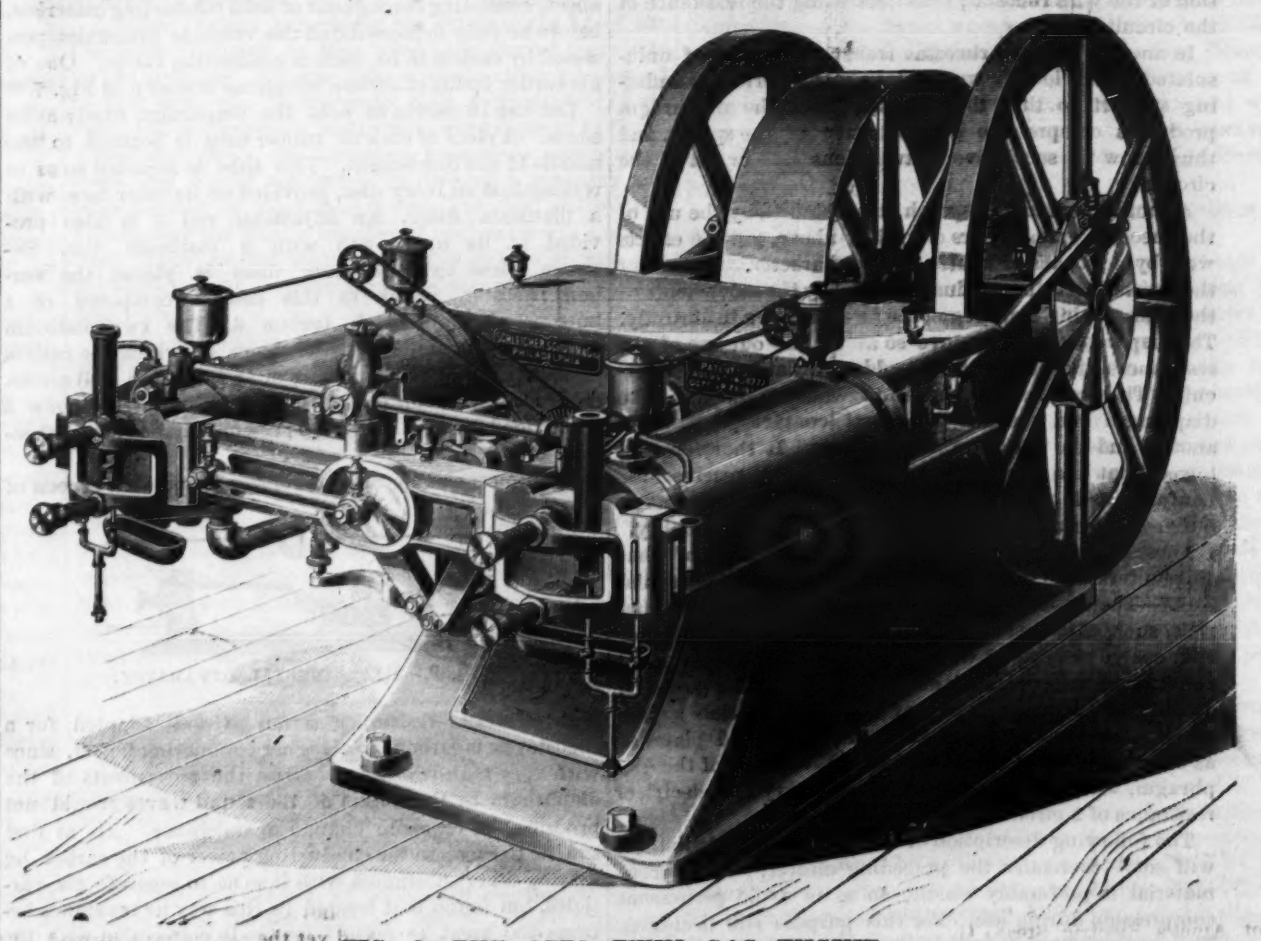


FIG. 2.—THE OTTO TWIN GAS ENGINE.

It will therefore be seen that in the future there is nothing to prevent the employment of gas engines for installations of considerable magnitude, and the success which has attended their employment thus far bids fair to continue and increase. Certain it is that from the standpoint of convenience, for small private installations, the gas engine presents a series of advantages which it would be difficult to equal in any other motor.

The New England Telephone Company's Quarterly Report.

The following figures are given as the quarterly report of the New England Telephone Company:

OCTOBER.	
Earnings	$76,707.67
Expenses	62,108.86
Net earnings	$14,598.81
Construction	19,086.19
Loss	4,487.38
NOVEMBER.	
Earnings	$76,737.43
Expenses	55,774.58
Net earnings	$20,962.85
Construction	22,746.85
Loss	$1,784.00
DECEMBER.	
Earnings	$76,123.19
Expenses	65,625.33
Net earnings	$10,497.86
Construction	15,831.02
Loss	$5,333.16
SUMMARY	
FOR THREE MONTHS ENDING DEC. 31, 1884.	
Earnings	$229,586.29
Expenses	183,508.77
Net earnings	$46,059.52
Construction	57,664.06
Loss for three months	$11,604.54

Distribution of High-Tension Current to Houses.

A new method, devised by Signor Meardi, of distributing high-tension continuous current to private houses is founded on the following principles: 1. Distribution in series of the leads to the apparatus in which the current is utilized, whether lamps, motors, accumulators, baths for electro-deposit, etc. 2. Sub-division of the current intensity among the line conductors in more ratios of various measure; and, consequently, conductors composed of so many elements, each of small section, limited, various and constant capacity, completely insulated and separated from one another. 3. Differential system of counter-tensions, and variable auxiliary resistances, with automatic regulators, capable of being worked by hand in the event of an audible signal being given by a tension indicator attached. 4. Utilization of the series at will, with slow and progressive graduation of the resistance, when the series is put in and out of circuit, and in measure as the ammeters and audible signals in the laboratory or place of production give warning in sufficient time of the need to modify the tension in the special element of the conductor, so that the intensity always remains constant.

Reduction of Erie Debt.—It is stated that the floating indebtedness of the Erie Telephone Company has been reduced to $134,000.

The Amet Electric Governors.

Among the numerous methods of regulating dynamo to supply a current in conformity with the number of lamps burning, that of varying the speed of the dynamo may be accounted one of the most simple. The regulation of the prime mover to which the dynamo is connected becomes a matter of importance, as its speed must vary with

FIG. 1.

every lamp put in or cut out of circuit, in order to prevent the destruction of dynamo or lamps. This is accomplished in an easy manner by the Amet Electric Governors, manufactured by the Globe Electric Engineering Company, of Chicago, Ill., in which any variation from the normal strength of current causes a corresponding influence to be exerted on the governor, and hence upon the speed of engine and dynamo.

In the accompanying illustrations, Fig. 1 represents one of Amet's Electric Steam Governors, while Fig. 2 is a water-wheel governor, designed on the same principle. As will be seen, the regulation is accomplished by a small train of gears driven by a small round belt from the shaft of the governor pulley, and two driving friction wheels moving in opposite directions. By means of an electro-magnet, included in the electric light circuit, the wheels are brought into frictional contact with a larger friction wheel, connected by bevel gears and a screw with the valve steam of the governor, thus varying its length according to the speed required of the dynamo for the number of lamps in circuit.

The tests made with this governor have shown it to be able to perform all that is claimed for it, and one of the tests at Carnegie's rolling mills proved the governor to be capable of exerting its influence in a wider range of duty than is ordinarily required of any governor.

Dangerous Leakage from Gas Pipes.

The inquiry into the consolidation of the New York gas companies is bringing to light many interesting facts, some of which we have already made note of. General Roome, president of the Manhattan Company, was very frank last Saturday in some of his admissions, one of which was of importance as bearing on the safety of gas pipes. His object, of course, was to prove the desirability of combination. He said: "When there are several companies, there must be several sets of pipes in many of the streets. That is a positive injury to the public. There is an instance of that now. Somewhere along Broadway there is a leak in the mains. It is between Dey street and Union square. No one can locate it or tell which company owns the leaking pipe. For three days my men have been trying to find it. They have built fires along the line on which complaint is made, for the purpose of getting at the pipes and finding the leak. There is danger of a great explosion from this cause. It may happen at any moment. If a single house should fill with gas and a person should enter that house with a light, the catastrophe may come. It may blow up the house and kill those in it or near it. *I have been worried so much about it that I have scarcely slept.* Our pipes may be all right. The leak may be in the pipes of some other company. The greater the number of pipes in a street, the greater the danger. Danger is especially great in the winter season, when the ground is frozen, because frost affects the pipes, and it is hard to get at them. I can remember several severe explosions in this city from broken or leaking pipes. In this case gas seems to have got into the track of the pneumatic tube which the Western Union Company has laid from its main office to Union square; but as it is impossible absolutely to confine gas, even in a pipe that seems perfectly tight, and as such a leak as this must be would travel through soil, it is by no means certain that the pipes lying nearest the track of the tube are the ones that are making the mischief. If there were but one set of pipes along Broadway, there would be much better chance of finding the leak. In Liverpool the gas companies were forced into consolidation in order to lessen danger by relieving the streets of all gas mains except one set." And yet the papers have teemed with Munchausen stories as to the danger of electric light wires! The plain fact is that an ordinary electric light wire is far safer than any gas pipe. Gen. Roome was not exaggerating. The explosions in the underground conduits at Philadelphia corroborate his statement, and during the last week the Boston papers reported that while members of the Malden fire department were examining fire hydrants there, gas which had leaked into a hydrant exploded, and two of the examiners were severely injured. For a week, the inhabitants of the east end of the city had been deprived of gas, and serious leaks were detected in several places.

The Kriebel Steam Engine.

In many small manufacturing establishments an independent source of power is often desirable, and especially in cities where steam distribution from central stations is carried on, small engines ranging from 2 to 10 horse-power find many applications. To meet this want the Kriebel engine, manufactured by Messrs. Rice, Whitacre & Co., of

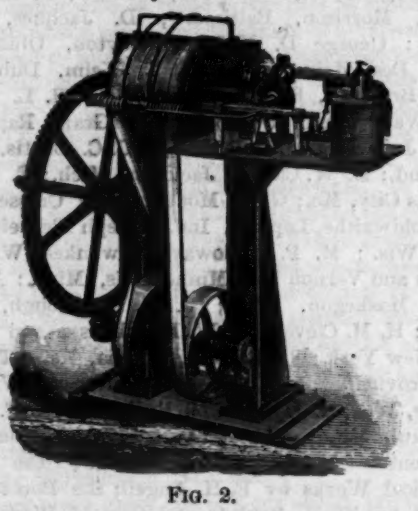
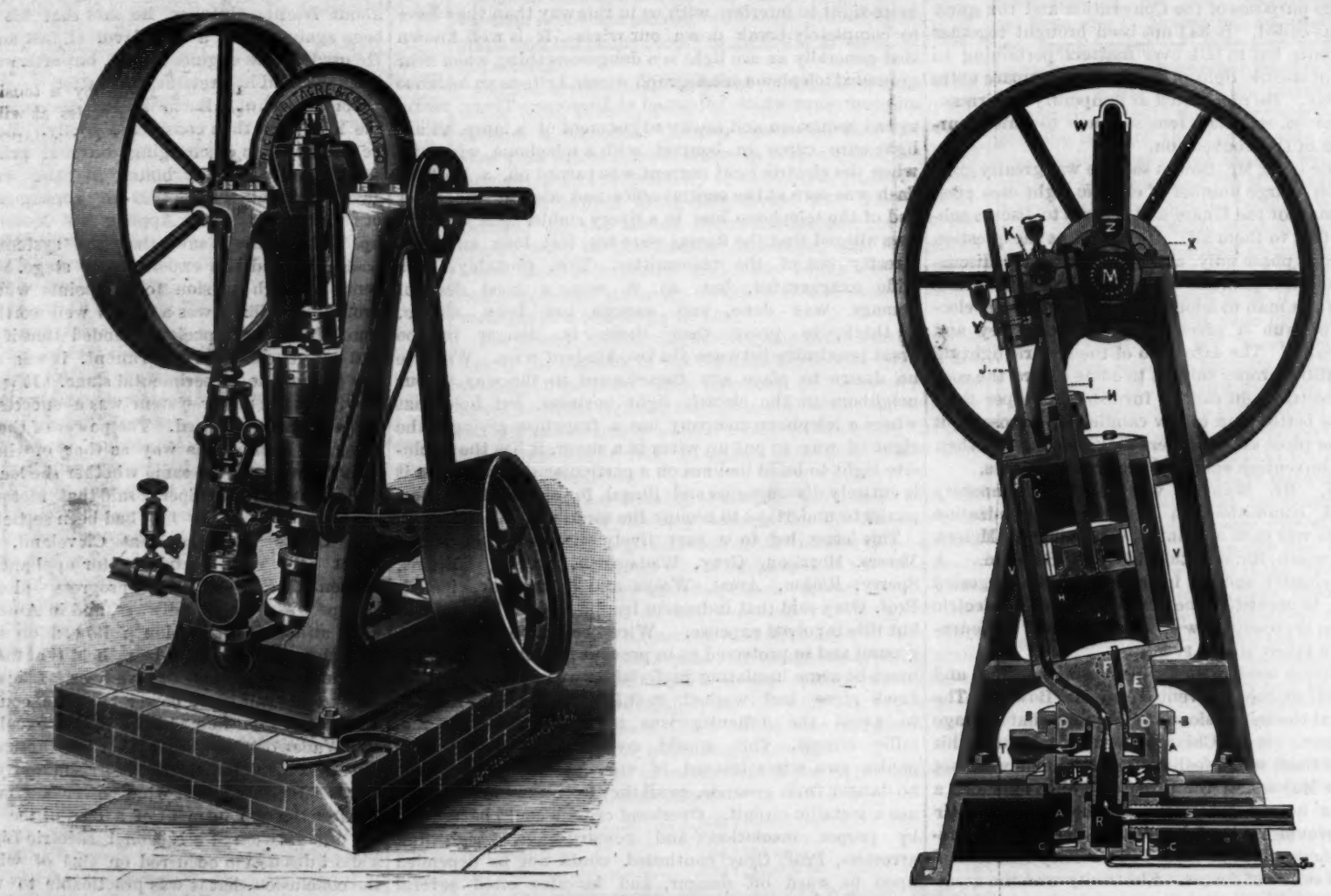


FIG. 2.

Chicago, Ill., has been constructed. In the accompanying illustrations, Figs. 1 and 2 show the engine in section and in perspective. The engine, as will be seen, is of the upright oscillating type and has a simple valve arrangement.

The lower end of the valve *E* is semi-cylindrical, and is seated in a steam-chest *DD*, which is inclosed in a casing *AA*, and supported on springs *UU*. These springs cause the chest to always make a steam-tight joint with the valve, allowing it to slide up when wear occurs, and are of sufficient strength to accomplish this without causing extra friction. A flanged packing cup *CC* fits into the lower part of the casing and packs a neck-shaped extension of the steam-chest, so steam cannot pass under the chest. The flange of the cup also packs the bottom of the casing, so steam cannot escape there.

There are two ports *PP* in the valve—one running along side of and opening into the top of the cylinder, and other connecting with the bottom of the cylinder. The steam-chest has a central steam-port *R*, which connects with the steam-pipe *S*, and one exhaust-port on each side of this, *OO*, which open into an annular exhaust-chamber *QQ*, connecting with the exhaust-pipe *T*. As the valve vibrates back and forth, each of the valve-ports alternately takes steam from the port *R*, and exhausts through the port *O*, on the corresponding side of the steam-chest; and while one valve-port takes steam the other exhausts, as shown in the cut. The engine is well made and finished and, judging from the testimonials of those who are using it, gives very good satisfaction.



FIGS. 1 AND 2.—THE KRIEBEL OSCILLATING ENGINE.

The Electric Light Convention.

(Special Telegram from our Regular Correspondent.)

CHICAGO, Feb. 27.—The Electric Light Convention was begun at the Grand Pacific Hotel on the 25th, in pursuance of the arrangements already noted. Among those present were Elisha Gray, City Electrician Barrett, Electric Light Inspector Haskins, Mayor Harrison, Messrs. S. S. Badger, Theo. P. Bailey, Geo. S. Bowen, Harold P. Brown, E. M. J. Buckley, W. L. Bush, G. L. Crossman, W. A. Hammett, W. T. Lewis, E. B. Palmer, M. C. Butterick, Edwin Place, Elmer A. Sperry, A. K. Stiles, C. J. Van Depoele, C. C. Warden, Chicago; S. Baldwin and J. F. Morrison, Baltimore; D. Jacques, Cookston, Minn.; George D. Fletcher, Dayton, Ohio; F. M. Mills, Des Moines, Ia.; E. T. Keim, Dubuque, Ia.; H. L. Brintnall, East Saginaw, Mich.; R. L. McDonald, Fort Wayne, Ind.; W. T. Powers, Grand Rapids, Mich.; R. M. Johnston, Hyde Park, Ill.; C. C. Curtis, Indianapolis, Ind.; D. W. Carter, Jackson, Mich.; E. R. Weeks, Kansas City, Mo.; G. R. Montague, La Crosse, Wis.; W. M. Goldwaithe, Laporte, Ind.; Joseph Flesheim, Menominee, Wis.; M. P. Holloway, Milwaukee, Wis.; W. H. Beach and Vernon Bell, Minneapolis, Minn.; Ambrose N. Bane, Muskegon, Mich.; J. H. Yarbrough, Nashville, Tenn.; H. M. Cleveland, W. Hochhausen and W. A. Hovey, New York; S. E. Locke, Omaha, Neb.; T. R. Robinson, Providence, R. I.; C. J. Richards and W. T. Lewis, Racine, Wis.; R. J. Randolph, Rockford, Ill.; C. B. Auken, St. Paul, Minn. The American Carbon Company was represented by T. P. Plumridge; the American Electrical Works by F. H. Angell; the Boulton Carbon Works by W. H. Boulton and Geo. H. Wadsworth; the Bridgeport Brass Company by H. N. Stanley; the Buffalo Electric Works by Albert L. Arey; Cleveland Carbon Works, by Charles E. French; Electrical Supply Company by F. S. Terry and J. H. Reid; Holmes, Booth & Haydens by H. C. Adams; the Ide Engine by A. L. Ide; the New England Glass Works by E. D. Libbey, A. W. McLaughlin, and J. W. Robinson; Parker Russell Mining and Manufacturing Company by G. W. Parker and L. M. Fisback; Pittsburgh Carbon Company by L. M. Slack; Railway Telegraph Supply Company by W. A. Knapp; Remington Electric Light System by E. W. Fox; Star Iron Tower Company by E. J. O'Beirne; Western Electric Company by Enos M. Barton, Charles A. Brown, John Young and Frank Stewart; Walworth & Lawton Manufacturing Company by C. Neville and W. C. Walworth; Brownlee & Co. by John N. Brownlee.

The meeting was called to order by Mr. Hovey, who enlarged on the purposes of the Convention and the spirit in which it was called. It had not been brought together to discuss systems, but to talk over matters pertaining to the operation of electric light plants, and to compare notes in a general way. He nominated as temporary chairman, Mr. Geo. S. Bowen, who had done so much toward securing the success of the Convention.

On taking the chair Mr. Bowen said he was greatly gratified to see such a large number of electric light men present from all parts of the Union and Canada to discuss subjects so important to them all. He looked at the question in its commercial phase only, and the matters for discussion all led up to this point: "What are the best means and methods for a man to adopt in order to take an electric light plant, run it successfully, make money and declare dividends?" The extension of the electric lighting business was also a proper subject to come before the convention. If electric light can be furnished cheaper than gas, and if it is better than tallow candles or kerosene, it should take the place of all other illuminants. He then declared the Convention open and ready for business.

On motion, Mr. Stanley was elected temporary Secretary. A committee on permanent organization and credentials was then appointed, consisting of Messrs. Brown, Wadsworth, Ridlon, Richards and Baldwin. A committee to classify and put in shape subjects suggested for discussion, to consist of one person from each electric lighting system represented, was next appointed. Adjournment was then taken until 2 P. M.

At the afternoon session Mayor Harrison appeared, and was introduced to the Convention by Mr. Bowen. The Mayor said that the impression was growing that Chicago was a dark place. Some Chicago citizens admitted this prejudice, and there was a feeling that strangers were not safe unless the Mayor and the Chief of Police extended a welcome and a hearty greeting. He hoped that their deliberations would be careful and wise, and that as a result of them there might be more light. They had to deal with the most subtle of forces. Electricity was the greatest agency handled by men. No one yet knew its full power, but that should not discourage them. If they rubbed their sweethearts' glossy locks, lo, a spark appeared (laughter and applause). It was all-powerful, but harmless when under control, and it was for them to work so that it might be harmless. He denied that he was opposed to electric lighting. Chicago wanted electric lights—but not death. The current was considered harmless when the wires were underground, but when the wires were overhead, destruction to life and property was possible. Chicago had fought against telegraph and telephone companies to get rid of aerial wires, but had fought them in a kindly spirit, and now the wires of the great trunk lines would this spring reach towns adjacent to Chicago by means of underground conduits. More light was certainly needed, but means should be devised to carry the wires below the surface. He closed by mentioning that he had stood in Chicago lately and talked with men in New York. (Applause). The time was coming when bottled electricity would be put on the street cars, and send them whirling from the heart of the city to the suburbs, and would also drive the cars on the elevated railroads. Once more, in the name of Chicago, he welcomed them. (Applause.)

At this point, Prof. Elisha Gray was introduced. He began by referring to the fact that his whole life had been devoted to electricity in its various applications, and that he could well remember when his mother's copper boilers and stove zincs had suffered in order to furnish him with battery elements. Electricity, he said, was the greatest science on earth and only on the threshold of its development, and he was glad that he lived in the nineteenth century in the midst of this development. He closed by saying that as yet we know next to nothing of this great science, compared with what will be discovered in the next fifty years. (Applause.)

The report of the Committee on Permanent Organization and Credentials was then received. The committee stated that they had decided to be liberal in regard to credentials, and to admit all whose names appeared on the register on the Chairman's table.

The election of officers was next proceeded with, and with the following results:

President—J. F. Morrison, of Baltimore.

Vice-Presidents—H. M. Cleveland, of Hartford; E. M. Barton, of Chicago; and J. H. Yarbrough, of Nashville, Tenn.

Secretary—W. A. Hovey, of Boston.

As the newly-elected President took his seat, Mr. Bowen, in behalf of the Western Electric Company, presented him with a gavel representing a commutator, which Mr. Morrison accepted in a few appropriate words.

After the members had been called to order by the President, the subject of "Crosses with Telephone Wires" was taken up. Regarding this, Mr. Brown submitted a letter from Supt. Hibbard, of the Wisconsin Telephone Company, which read substantially as follows: "Our complaint against electric light companies is, that in a number of instances they have disregarded our interests entirely. They have erected their lines along the same side of the street occupied by our wires, and the induction resulting from the heavy currents of the former has caused great annoyance by the humming noises in the telephones. I hold that they have been overreaching and have taken unwarrantable liberties, and that they have no more right to interfere with us in this way than they have to completely break down our wires. It is well known that generally an arc light is a dangerous thing when near grounded telephone or telegraph wires. I cite as an instance an occurrence which happened at Lacrosse. There, owing to bad insulation and faulty adjustment of a lamp, an arc light wire came in contact with a telephone wire, and when the electric light current was turned on, a brilliant flash was seen at the central office and also at the other end of the telephone line in a livery stable. An eye-witness alleged that the flames were ten feet long and shot directly out of the transmitter. This, probably, is a trifle exaggerated, but as it was, a good deal of damage was done, and enough has been shown, I think, to prove that there is danger in too great proximity between the two kinds of wire. We have no desire to place any impediment in the way of our neighbors in the electric light business, but hold that where a telephone company has a franchise giving it the right of way to put up wires in a street, it has the exclusive right to build its lines on a particular side, and that it is entirely discourteous and illegal for electric light companies to undertake to occupy the same side."

This letter led to a very lively discussion, in which Messrs. Morrison, Gray, Wadsworth, Badger, Haskins, Sperry, Ridlon, Amet, Weeks and Hovey participated. Prof. Gray said that induction troubles might be avoided, but this involved expense. Wires could be run underground and so protected as to prevent induction, but there must be some insulating material between the two wires. Lead pipes had worked well, and another method to avoid the difficulty was to use a complete metallic circuit. This would cost the telephone companies two wires instead of one, but there would be no danger from grounds, as all the electric light companies use a metallic circuit. Overhead crosses could be avoided by proper insulation and construction. Lightning arresters, Prof. Gray continued, could not be depended upon to ward off danger, and he also cited several instances where electric light and telephone wires ran side by side without serious disturbance to the telephone service, but in those cases there was good construction and insulation.

Prof. Gray was followed by Mr. Morrison with one of the brightest and most forcible speeches of the day, in which Mr. Hibbard was handled without gloves. The speaker regarded the statements in Mr. Hibbard's letter as unfair and unjust. He spoke of the induction question as a bugbear, and remarked that Prof. Gray had skillfully gone around the matter and touched up the telephone side of the question alone, avoiding the electric light companies' position entirely. When the electric light became a success the telephone companies raised an outcry against the lighting companies and wanted the latter to go on other streets and to keep out of the way of their telephone wires. The electric light, he said, was not a luxury, but a necessity, as much so as the telephone, and as such should be allowed to run in the streets, if law and order are to be preserved and the police kept tolerably safe. (Laughter.) Properly constructed, electric light circuits were no more dangerous than a buzz-saw in a saw-mill, and telephone wires could be run alongside the light wires, provided the insulation did not wear off. Mr. Morrison closed by saying that every city except Chicago had granted rights of way to electric light companies, and that if the latter's wires were forced underground all others should be likewise.

Mr. Morrison's remarks elicited frequent applause, and he was followed by Mr. Hovey, who stated that 78 per cent. of the fires by wires in New York City were caused by those underground.

Prof. Gray, in a short speech, recommended the establishment of electric light and telephone stations of observation for the purpose of studying the phenomena and facts relating to both; this, he said, would be better than all theories.

When the subject of electric lighting by water-power was brought up, Fletcher, of Dayton, O., created great amusement by his description of his plant for furnishing electric lights. He said the Lord had given him an engineer in the shape of a turbine water wheel which was seventeen years old, and cost $1,250 when new. His carbons cost him $15 a thousand, and he ran thirty lights. The wheel ran a saw-mill as well as the dynamo. The cheapness of the plant and Fletcher's manner of stating the facts and his experience, convulsed the Convention with laughter.

At this point the Chair appointed committees to report on the relative cost of equipping and running plants operated by water and steam-power, but as the majority of the Convention did not think that such a report should be published, the appointment of committees was revoked. The Convention then adjourned until 7:30 P. M.

At the evening session, the first question brought up was "The Best Mode of Connecting Dynamos with Power." Mr. Ide gave a description of the plant of his company at Springfield, Ill., and was followed by Mr. Stewart, who held that the best means was belting direct from the engine to the dynamo. Mr. Weeks was of the same opinion. Mr. Sperry said he avoided perpendicular belting. There was a disadvantage also in using belting too heavy or too thick. President Morrison then gave an interesting description of plants at New York, Philadelphia and Baltimore, and their method of belting. In reply to a question about friction clutches, he said that his experience had been against them and in favor of fast and loose pulleys. He used Corliss engines at first, but afterwards substituted Buckeye, and had retained the latter.

The subject of "Rates and Rebates on Electric Lights by the Year" was then considered briefly. Mr. Randolph said he had a system of charging different prices for circuits started at different hours in the evening, which gave general satisfaction to consumers. The "Use of Electricity as Applied to Motors" next came up. Mr. Hovey said that the systems had not yet passed beyond the experimental stage. To carry currents of high tension to the points where they can be profitably utilized, was a matter well worthy of consideration. Mr. Van Depoele contended that if the application had not gone beyond experiment, it was certainly at the last part of the experimental stage. It was certain, anyhow, that the motor system was a success. That much had been demonstrated. The power of the motor could be governed in the same way as that of the engine; speed would always be the same whether the load was increased or decreased. Mr. Sperry said that motors could be successfully run. That fact had been settled beyond doubt. Mr. Curtis remarked that Cleveland, O., was using street cars with electric motor appliances. Mr. Hochhausen dwelt on the progress already made in Europe with electric railways, and in America as well. A very animated discussion followed on the question of "renting out" power, it being held that the practice should be guided by the law of averages. It was possible for a man to rent out more power than he could actually furnish at any one time, should it all be called for at once. Mr. Wadsworth said that that was actually done in Boston and Philadelphia. Mr. Morrison and others held that it was safer only to sell what power one had.

After the appointment of a committee to report upon the organization of a National Electric Light Association, a short discussion occurred on size of wires, resulting in the conclusion that it was practicable to use Nos. 4 and 6 wires in same circuit, provided the current was not too large to be carried by the smaller conductor. The Convention then adjourned until 10 A. M. Thursday.

At the morning session on Thursday the first topic brought up for discussion was entitled, "Will Armatures Become Affected by Frost When Exposed During Transportation?" Mr. Van Depoele, who was to have opened the discussion, being absent, the matter was passed over temporarily.

Pending the arrival of the latter gentleman, Mr. C. C. Haskins arose and spoke on the topic of "Special Insulation or Guards to Insulation of Lines at Dangerous Points and Places." He said that absolutely waterproof wires had not yet been found. At the ter-

minals of underground wires difficulty arose from the condensation of moisture, and the only remedy was to tail out with paraffin. Hard rubber often gave unsatisfactory results as an insulator. Mr. Haskins added that, notwithstanding the severe restrictions under which the electric light companies were placed in Chicago, he thought they were generally satisfied.

Mr. Place thought that the location of wires should always be known.

Mr. Haskins again taking the floor, remarked that he had known cases where dynamos, originally thoroughly insulated from grounds, had afterward become grounded through the medium of dirty oil. Pure oil, he added, was an insulator, but dirty oil was sometimes a conductor.

Mr. Van Depoele having arrived in the mean time, the first question, regarding the effects of frost upon armatures during transportation, was taken up. Mr. Van Depoele said that he did not think that armatures were ever affected under such circumstances. It was true that he had sent out dynamos that would not work from the alleged effects of frost. On investigation, however, it always turned out that the people receiving the machines either had not known how to connect them up, or that the latter had become reversed. They put no faith whatever in the idea that armatures were affected by frost.

Mr. Sperry thought that in some cases accumulated frost might melt and thus make itself felt in that way.

The question of "Incandescent Lights," particularly with regard to the length of circuit on which they can be run with profit, was next taken up. Mr. Sperry opened the discussion by stating that the matter was purely one of mathematics. The distance depended upon the resistance of the lamps and the electromotive force employed in the system. Experiments had been made to develop very high electromotive force, but there seemed to be well-defined limits beyond which they cannot be carried. Mr. Wadsworth cited some instances in New York where incandescent lamps were fed by currents four and one half miles distant from the dynamos. The speaker did not know whether the arrangement was an economical one or not.

Mr. Van Depoele stated that the multiple arc system was the best to employ with conductors of fairly large size.

Speaking on this question also, Mr. Cleveland stated that they had one central station in a large city which he had divided into sub-divisions of one square mile each, so that the current had to be conducted only for a distance of half a mile.

Mr. Plumridge also remarked that he understood that Mr. Heisler, of St. Louis, had invented an incandescent system by which the current could be transmitted ten miles without difficulty.

"Street Lighting" next occupied the attention of the Convention. Mr. Bowen opened the discussion by saying that one method was to hang the lamps at the intersection of streets. The city of Nashville, he thought, presented the best example of this method. In the speaker's opinion, the best economy was attained by the tower system, which would light up all the city streets, alleys and yards. He considered six lights on a tower equal to eighteen lights on poles, and he estimated that a tower with six lights would light a mile square. For good economy, however, the towers should not be too high.

Continuing the discussion, Mr. Weeks said that he had made pole and tower lighting a subject of investigation, and he had found that where streets were wide and at right angles, the tower system gave tolerable satisfaction, but where streets were narrow and not at right angles it was generally unsatisfactory. In the city of Quincy, the lights are placed on poles at the intersections of streets, about 35 feet from the ground, and the system is a notable success. The speaker stated that he had made tests there and in the business districts and could find no place where he could not read nonpareil type. In his opinion the pole system was the best.

During the discussion, it came out that the Dayton Company could afford to furnish the city with lamps every night at $150 per annum per lamp, using water power.

In some additional remarks, Mr. Bowen said that in many cases it was advisable to combine the pole and tower systems.

At the Thursday afternoon session, the committee previously appointed reported on the "Best Way to Prevent Trouble where Electric Light and Telephone Wires are in Close Proximity." Their report was in direct line of debate on this subject.

The next subject was: "Experience with Copper-Coated and Uncoated Carbons." Mr. Wadsworth's experience had been in favor of plain carbon for pure and unobstructed light. No matter how much care was taken, the coating would be of unequal thickness. The copper will also melt and fall down on the shade and often break it. None of these troubles are experienced with plain carbons, and where the lamp is provided with a guide the plain carbon feeds better. The difference in price and resistance was inappreciable. Mr. Parker thought that nine-tenths of the carbons used were coated. If plain carbons were better, why was this? Mr. Wadsworth said the reason lay in the durability of the carbons. The *ne plus ultra* would be a plain carbon with good lasting qualities. Mr. Van Depoele said that with low electromotive force and increased quantity, he would prefer coated carbons. President Morrison said his experience and views were like those of Mr. Van Depoele; he preferred coated carbons. Mr. Donaldson said his experience had been that with a plain carbon they got the best light, but that the endurance was not so great. He preferred plain carbons. Mr. Arey said that his tests showed a difference of three-tenths of an ohm resistance between the two kinds. Theoretically, they ought to get steadier light from coated carbons. How it was practically he did not know.

All the questions brought before the Convention having been disposed of, the report of the committee on permanent organization was heard and adopted. The name selected was "National Electric Light Association." The following officers were elected for the ensuing year: President, J. F. Morrison; Vice-Presidents, Messrs. Weeks, Cleveland and Yarbrough; Secretary, W. A. Hovey; Executive Committee, Messrs. Bowen, Fletcher, Ridlon, Hochhausen and O'Connor. After listening to a short speech from President Morrison and passing resolutions complimenting the press and the management of the hotel, the Convention adjourned *sine die*. The next meeting will probably be held in July.

A great deal of praise is due the different local committees for the endeavors they have made to get as many people as possible together at this first Convention, and it is safe to say that with less energetic and persevering action on their part the Convention would never have been called to order. The committees had very little time in which to do their work, but they have used it to the best advantage. A circular calling the Convention, and suggesting what seemed to the committee proper subjects for discussion, was prepared, and was given general circulation. This was accompanied by a postal card, which the recipients were requested to return to the Secretary of the Invitation Committee, with further subjects for discussion, and with the name of the person who would represent them at the Convention. In this way it was known beforehand just about how many people would be present, and the subjects it was desired to bring before the meeting. In putting the credit in this matter where it belongs, personal mention should be made of Mr. Geo. S. Bowen and Messrs. J. H. Reid and F. S. Terry, for their efforts, as they took hold of the matter when it seemed to have fallen flat, and by persistent agitation helped very materially in making the Convention the success it was.

WESTERN NOTES.

THE ELECTRICAL WORLD BRANCH OFFICE,
CHICAGO, Feb. 26, 1885.

Some of the small towns, with hardly more than a single business street, are passing ordinances to compel the telegraph and telephone people to go under ground, or "see" the council.

In most of the annual reports of the telephone companies, in the West, at least, a very noticeable increase in toll line mileage is recorded. This is due to the fact that these lines yield much more revenue, in proportion to the outlay required, than the generalty of exchanges do, and if some one would happen along and invent an "automatic exchange," by the use of which the operator could be dispensed with in the smaller exchanges, the companies would make more money, and many towns which cannot now support an exchange would be able to secure the advantages of a telephone service.

The Sperry Electric Light Company suffer a considerable loss by the burning of the Grannis block, this city, on the evening of the 19th. The company had recently established a central lighting station in this block, and not only suffer a money loss of several thousand dollars by the fire, but a good deal of delay in certain extensions which they were contemplating.

The Milwaukee *Evening Wisconsin* says that with the economizing and pinching brought on by last year's depression came a large decrease in the number of telephones at all cities and towns where exchanges of the Wisconsin Telephone Company are established. About Nov. 1, however, things began to improve, and two hundred telephones have been connected with exchanges in the State since Dec. 1. The Milwaukee exchange is increasing at the rate of one hundred subscribers per month, according to the above-mentioned paper, and the company contemplate the opening of branch offices on the west and south sides, to accommodate the increasing patronage.

The total number of subscribers at the larger exchanges in the State is now as follows:

Milwaukee	1,355	Green Bay	147
Racine	215	Oshkosh	144
La Crosse	184	Madison	139
Eau Claire	182	Appleton	118

In the annunciator department the Western Electric Company report the following: Link Belt Machinery Company's office; residences of W. W. Kimball, C. H. McConnell, R. W. Rathborne, F. E. Bigden and the Stevenson flats on the north side.

The Jackson (Michigan) Electric Light Company has begun the erection of a handsome block in that city.

A mast 120 feet high carries the Niobrara and Running Water telephone wire across the Mississippi River above the reach of steamboat smokestacks.

Foreman of Construction D. B. Macquarrie has been appointed manager of the Kansas City telephone exchange.

The old suit of the Foster Telephone Company against Adolph Loeb, to compel payment of $1,500 worth of stock in the company, which has been held under advisement by Judge Moran for six months, was finally decided by him in Chicago on the 21st. Foster had an invention which he sold to the telephone company, taking as payment $75,000 worth of the company's stock. It was worthless and Foster knew it. He, however, disposed of some of the stock of the company, marked "full paid, non-assessable," to Loeb. The company sued Loeb, charging that it had been defrauded by Foster into giving him stock without consideration, and requesting that Loeb be compelled to pay for what he held. The judge dismissed the bill for want of equity. The question involved, he said, was whether the defendant had full and open knowledge of an implication of fraud on the part of Foster. If an innocent person purchased the stock of a corporation which appeared to be fully paid up, without knowledge of fraud, he could not be assessed either by the corporation or the creditor. If the defendant knew that the stock had been issued for property, and that said property was not worth the amount of stock paid, and if he had a full and open notice of fraud, he would be chargeable. In this case the court did not think the evidence showed the defendant had any such knowledge. The information given by Foster to Loeb did not convey such facts as would raise an implication to Loeb that Foster had got control of the stock by fraud. From the evidence the question was a close one. Nobody not skilled could form any opinion as to the value of the patented invention. The telling to Loeb by Foster of how he came to be possessed of the stock was not an implication of fraud. Fraud was not to be inferred or presumed, but proven. The court, therefore, denied the former decree as against Loeb.

There was a great hue and cry raised, immediately after the Grannis Block fire, to the effect that the conflagration had been caused by the electric light wire in the building. The *Inter-Ocean* got itself worked up to an especially high degree, and while in that condition gave vent to the following: "Fair-minded landlords are and should be careful to recognize some few rights as belonging to tenants. Prominent among said rights is one that may or may not be mentioned with special timeliness at this writing. We refer to the just expectation of tenants that the conditions under which they take a lease, say of an office, shall not be radically or materially changed by the landlord during the continuance of said lease. For instance, with what right or common decency could the owner or agent of a first-class office-building fill up the offices above the sidewalk with a class of tenants usually seeking such superior accommodation, and then turn round and rent out the basement or sub-basement of his office-building for the manufacture of gunpowder or dynamite? Evidently, no matter what might be the legal aspect of the act, a great wrong would be perpetrated and the other tenants would have the right, or at least would exercise the privilege, to kick, and kick vigorously. Justly the charge would be made against the grasping landlord that for the sake of a little paltry additional rent he had shown himself willing to jeopardize the property and even the lives of his office-tenants. And if it should turn out that the building was the reverse of fireproof, indeed a veritable wood-pile, and on the confession of even its own architect an unsafe place, the righteous wrath of tenants above ground would scarcely be lessened. Equally improper would it be if a dynamo machine for generating electric light were introduced into such first-class office-building, nor would the impropriety be less even though some fire insurance scalper, only anxious for a continuance of his commissions on the main job, should be so accommodating to the landlord or agent as not to advance the insurance rate in proportion to the greatly increased risk." The association by the *Inter-Ocean* of electric light apparatus with dynamite and gunpowder is certainly very amusing to any one acquainted with the subject, and the whole article appears very ridiculous in the light of testimony taken before the fire marshal on the 23d. That testimony shows that there was neither an electric light wire nor any electric light apparatus within twenty-five feet of the *bottom* of the elevator shaft, and that the fire originated at the elevator shaft in the *fifth story*.

THE TELEGRAPH.

Louisville Electrical Supply Company.—The Louisville (Ky.) *Post* says that the business of this concern is rapidly growing, the demand for goods West and South being very brisk. Mr. W. H. Johnson is the manager.

Underground Wires in Pennsylvania.—A dispatch of Feb. 19, from Harrisburg, Pa., says: "The bill requiring all electric wires to be placed underground has greatly agitated the telegraph, telephone and electric light companies. The Western Union Telegraph Company, in anticipation of a hearing to-day before the House Committee on Municipal Corporations, had their lawyers on hand to oppose the proposed revolution of the telegraph system. Their attorneys surprised the committee by stating that they preferred not to make known their position in oratory until the friends of the bill had opened the argument. Members of the committee insisted in vain that the only argument against overhead wires was that they were a nuisance. The Western Union lawyers laughed all over when the committee postponed the hearing until Tuesday morning next, as delay will assist in crowding out the bill at this session. There are more than enough bills before it on the calendar to keep the Legislature busy until adjournment, and unless the measure be taken up out of order the chances are that it will not be reached on final passage."

THE TELEPHONE.

Tropical Company's Exchanges.—The company reports the following exchanges recently started: United States of Colombia, Bogota, 100 subscribers; Barranquilla, 30 subscribers; Central America, Guatemala, 90 subscribers; West Indies, Kingston, Jamaica, 53 subscribers.

Erie's Officers.—There has been a change in the executive of the Erie Telegraph and Telephone Company. At a meeting of the directors, Monday, the 23d, W. A. Ingham tendered his resignation as president and director, and it was accepted. James W. Bennett was unanimously chosen his successor as president.

Street Telephonic Stations in Paris.—The installation of telephonic "kiosks" or stands for the use of the public in Paris, commenced lately by the General Telephone Company, is being extended. Since the 3d inst. nine new offices have been added, bringing up the total number now in use to fourteen.

The Thermo-Microphone.—Some interesting experiments with this transmitter were recently made in Paris at the hall of the French Geographical Society, and a large audience were enabled to hear a singer and various instruments performing in a room a considerable distance away. This experiment was a very remarkable one, although at the end of the trial the loudness and clearness of the tones diminished considerably, possibly on account of defective regulation. In its normal condition the sound transmitted by the thermo-microphone is very excellent, even to an audience 35 ft. or 40 ft. away.

THE ELECTRIC LIGHT.

In a Large Meat Store.—Mr. O. Hammond, Jr., Baltimore, Md., wholesale dealer in fresh meats, is putting in a 400-light Edison plant. A Ball automatic cut-off engine will drive the dynamo.

Ithaca, N. Y.—The superintendent of the Brush-Swan Company, now building a new station, is Mr. John V. Cartwright. The village uses 73 lamps for street lighting, and the prospects of the young company are very good.

An Active Demand for Engines.—The Westinghouse Machine Company, of Pittsburgh, report trade as opening remarkably active in 1885. Their sales for the month of January were 67 engines, aggregating 1,752 horse-power, which is certainly good for hard times. The electric light industry still continues to furnish plenty of business. Besides a large number of engines for lighting private establishments, they have contracted for the following public stations: The Newton Electric Light Company, of Newton, Iowa, one Westinghouse automatic engine of 35 horse-power; the Champion Electric Light Company, of Springfield, O., two engines of 60 horse-power each; the Excelsior Electric Light Company, Port Huron, Mich., one 60 horse-power Westinghouse automatic engine; the Northwestern Electric Light and Power Company, of Omaha, Neb., one engine of 45 horse-power; the Weston Electric Light Company, Lexington, Ky., one 80 horse-power engine, being the second one within two years; the Brush Electric Light Company, of Buffalo, N. Y., also order two more engines of 65 horse-power each, making twelve Westinghouse engines in all which are running in their principal stations.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—Am. Cable, b 54, a 54¾; B. & M., b 1, a 3; Mutual Union, b 14½; Postal sixes, b 20¼; Western Union, b 59¾, a 59⅞.

Telephone.—Am. Bell, b 217, a 217½; Erie, b 21½; New England, b 25¾, a 26; Tropical, b 1¼.

The Boston *Herald* of Feb. 25 says: "Bell telephone stock was steady at 217. The final hearing in the suit against the Molecular Company in New York, due yesterday, was postponed to March 30, and the suit against the Clay Commercial Company of Philadelphia, to have been heard to-day, was postponed to March 3.

"New England telephone fell on moderate sales to 25¾. The company has reduced its net debt the past year, beside paying considerable sums for reconstruction. Somebody who signs himself 'The Telephone Subscribers' Union,' with a certain Boston post-office address, has issued a circular inviting co-operation in a movement to restrict the price of telephone service by legislation. All telephone subscribers are asked to sign the E. H. Morse petition to the Legislature favoring such restriction. Any reduction of telephone charges would cripple the New England Company. The place to cut, if a cut is to be made, is in the rental charged by the parent organization to the sub-company."

Electric Light.—Am. Elec. & Illu. com., b 1⅝; Edison, b 60.

BUSINESS NOTICES.

Correction.—By reason of the transposition of the words "The Original" in Mr. A. L. Bogart's business notice in the last number of THE ELECTRICAL WORLD, patent No. 259,267 was made to read, The Original Automatic Burner, whereas patent No. 225,971 should have read the original ratchet pendant burner.

Medical Electric Machines.—The general advance in electrical science of recent years has made itself felt in medical as well as other electrical apparatus. Some of the most satisfactory instruments are those manufactured by the Jerome Kidder Co., of 820 Broadway, New York. They have received a number of awards for superiority, and well deserve it for their fine finish and durable powers.—*Medical and Surgical Reporter.*

Anti-Magnetic Shields for Watches.—The application of anti-magnetic shields to pocket time-pieces promises to be of great importance. It will render operative the fine adjustments and mechanisms which hitherto have been made almost *nil* and inoperative on account of their susceptibility to the all-pervading magnetic influence. It is undoubtedly a fact that the variations in time or rating of watches carried by railroad men have been in most cases caused by magnetism instead of by jolting, as has been heretofore thought. The anti-magnetic shield is made by Giles Brothers & Co., State and Washington streets, Chicago, is a protection for the works of a watch against magnetism from any source, and the attention of people who desire their watches to keep good time is called to this fact. Giles Brothers & Co. have many testimonials in regard to the efficacy of their shields when applied to watches. They also demagnetize watches which are already affected.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED FEB. 10, 1885.

Apparatus for Filling Lead Pipes of Telegraph Cables; William R. Patterson, Chicago, Ill., Assignor to the Western Electric Co., of same place..... 311,913

Consists of a reel with a flexible cable wound thereon during the process of filling, and provided with a chamber on which are pipes leading thereto through the hollow axles, and cocks for turning on steam and cold water, whereby the cable wound upon the drum may be heated and cooled.

Joint for Electric Arc Light Cables; Wm. R. Patterson, Chicago, Ill., Assignor to the Western Electric Co., of same place..... 311,914

Consists in modifications in the means for connecting the sections together, in order that four ends of the conductors may be taken out at the joint, so as to afford facilities for connecting with arc lamps which are placed one after another in the circuit and not in multiple arc, as is the case in incandescent systems of lighting. Cross pieces are adjustable and removable, and when removed expose the four ends of the wires.

PATENT NO. 312,178.

Thermostat; George R. Williams, Ithaca, N. Y..... 311,933

The vibrations of a thermal bar complete or open the circuit which leads to a device whereby a damper in a furnace is opened or shut more or less.

Telephonic Circuit and Apparatus; Louis A. Berthon, Paris, France, Assignor to the Société Générale des Téléphones, of same place..... 311,944

Consists of the combination of a telephonic circuit having double-wire lines, for use as a complete metallic circuit for ordinary telephonic purposes, with the means for automatically connecting both ends of said line-wires with the earth for effecting a direct call between subscribers, whereby both wires form one line for the travel of the current in one direction, while the earth is utilized for the return side of the circuit.

Telegraphic and Telephonic Instrument Protector; George A. Cardwell, Brooklyn, N. Y., Assignor to himself, Frederick K. Fitch, New York, N. Y., and Joseph H. Murray, Newark, N. J..... 311,957

Consists of two electro-magnets, one wound with coarse wire only and not normally in circuit, the other wound with two separate non-continuous superposed coils, one of fine wire and the other of coarse wire, but both coils in the same normal circuit, the instruments to be protected being interposed between the coils or parts of a coil, and of conducting-armatures of two electro-magnets having insulated ends electrically connected but mechanically independent.

Memorandum Holder for Telephone Boxes; J. F. Gilliland, Indianapolis, Ind..... 311,977

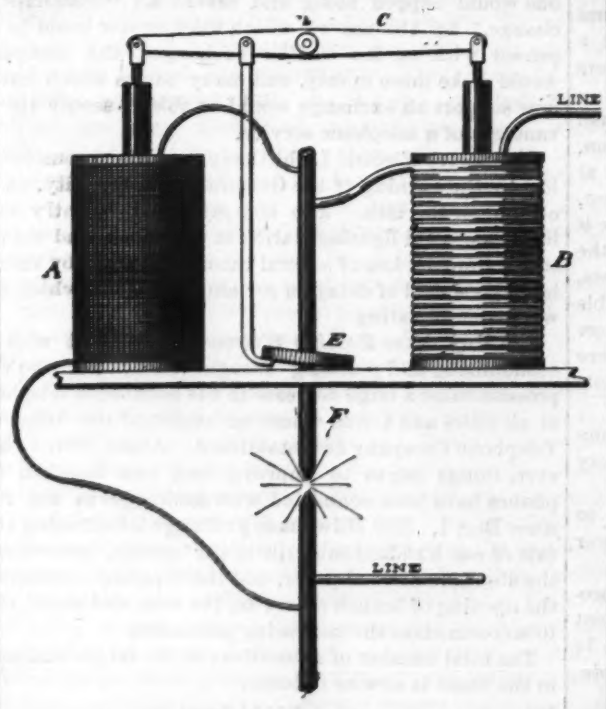
Consists in a clip adapted to pass across the top of the shelf composing the top of the battery-box and under its edges, where it is secured by appropriate fastenings. To this clip may be secured a pencil and a paper-file hook.

Telephonic Transmitter; John H. Guest, Brooklyn, N. Y..... 311,979

Consists in inclosing the electrodes and connections inside of a glass case, a portion of which is the diaphragm.

Armature for Dynamo Electric Machines; Frederick K. Fitch, New York, Assignor to the Fitch Electric Lighting & Construction Co., of same place... 312,111

A series of tubular rings having approximately the diameter which it is desired to give to the armature are placed side by side and secured together by bolts extending parallel with the axis. They are prevented from making magnetic contact with each other, and are at the same time electrically insulated from each other by means of washers of non-magnetic and non-conducting material.



PATENT NO. 312,184.

Telephone Transmitters; Charles A. Randall, New York, N. Y..... 312,160 and 312,161

The first consists in the use of an extended range of contact-surface, obtained by making one of the electrodes slightly concave, and so pivoting or supporting it that it may press firmly and squarely around its whole edge upon the other electrode, both being made of an enlarged area, so as to increase the contact-surface, which of course may be varied as may be required. The second consists of the combination, with the electrode supports and the electrodes, of a spring adapted and adjusted to bring the electrodes into firm and strong contact normally, and an adjusting-screw for maintaining them normally in such relative position and limiting the movement of the electrodes toward each other upon vibration of the diaphragm.

Telephone Receiver; Charles A. Randall, New York, N. Y..... 312,162

Consists of the combination of four or more permanent magnets united at one end of each, the other ends being free and forming a magnetic field, the magnets being arranged longitudinally beneath the diaphragm, and having their similar poles facing each other. The magnets inclose a helix, whose core is united to the attached ends of the permanent magnets. An additional core is fixed to the diaphragm.

Electro-Magnetic Toy Swing; Murray Bacon, Philadelphia, Pa., Assignor to the Novelty Electric Co., of same place..... 312,178

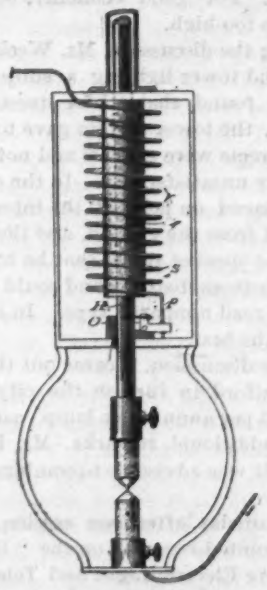
To the base *A* is secured an electro-magnet *G*, in such a position that its pole or poles will be under the cross-piece *E* when the swing is at rest, this cross-piece *E* being of metal and forming an armature for the electro-magnet. One of the terminals of the electro-magnet is connected to a binding-post *p'*, while the other is connected to one of the legs of the side frame *B'*.

Electric Arc Lamp; Charles F. Brush, Cleveland, O. 312,184

As noticed in the cut, the adjustment of the position of the carbons is effected by what may properly be called an electrical balance or scale, in which the beam *C* tilts in one direction or the other, according to the comparative magnetic forces exerted upon the cores of the magnets *A* and *B* connected up respectively in a continuous shunt and continuous main current, the effort being communicated to the well-known ring clutch *E*.

Feed Regulator for Electric Arc Lamps; Sidney H. Short, Denver, Col..... 312,242

It is a well-known principle that parallel currents in the same



PATENT NO. 312,243.

direction attract each other, and the effect of these currents traveling around a permanent magnet would be to move the convolutions of elastic coils closer together, and the two forces acting together would lift the lower ends of the elastic coils, whereby the current would be shifted from one coil into the other under abnormal conditions. When the circuit is again made in the lamp or other electric receptive apparatus, the current is so reduced in one of the coils as to allow the lever to drop back to its original position.

Feed Regulator for Electric Arc Lamps; Sidney H. Short, Denver, Col..... 312,243

A spiral spring *S*, of conducting material, surrounds a magnet. The lower end *p* is connected to a clutch *O*, adapted to clamp the carbon holder whenever the end *p* of the wire is lifted. By the attraction of the parallel currents in the coils and also by their effect upon the lines of force of the magnet, the lower end of the coil will be lifted up, causing the clutch *O* to grasp the carbon-holder *H* to lift it, and to separate the carbons. After the carbons have burned, and the arc becomes long, the resistance will be correspondingly increased, and less current will pass through the coil *S*. Consequently the coil will be increased in length, releasing the clutch from the holder *H* and allowing the carbon points to come to adjustment.